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PP/ RWC/RWCc - R22/R407c - 50-60 Hz / 2005 / rev.0

Installation, Operation & Maintenance Manual

RWC /RWCc User's Manual

PETRA ENGINEERING INDUSTRIES CO

Air Cooled Water Chiller
with Hermetic Compressor

R-22/R-407c

CHILLERS

www.petra-eng.com

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GENERAL

The following symbols will used in this operational manual to alert you to areas of potential hazard

A NOTE is used to highlight additional data that may be helpful to you.

An IMPORTANT is used to focus upon information which must be noted.

A CATION is used to identify a hazard which could lead to personal or machine injury.

A WARNING is used to identify a hazard which could lead to personal death or machine destruction or break down.

This manual covers the installation, operation and maintenance of PETRA's RWC Series. This will ensure proper operation and ensures a long service life of the unit.

All procedure presented in this manual, like installation, operation and maintenance must be performed by trained and qualified person

For more information please contact your local PETRA and service center or refer to PETRA Factory

DEAR CUSTOMER

Thank You for choosing PETRA Residential Water Chiller (RWC) unit with hermetic (reciprocating/scroll) compressor. Please take the time to go through this manual as it contains valuable information on installation, operation and maintenance of the unit. This will help you to use your unit for a long time.

Unit capacities in this series range are as follow

RWC: 2-50 nominal tons @ 50 Hz
2-55 nominal tons @ 60 Hz

RWCc: 1.9-45.5 nominal tons @ 50 Hz
2.1-56.8 nominal tons @ 60 Hz

If you need any more information about PETRA's RWC units or other units, please do not hesitate to contact us at your nearest sales office.

Receiving

On arrival, inspect the unit before signing the delivery note. Specify any damage on the delivery note and send letter of protest to the last carrier of the goods.

Inspection

Check the shipment received against the shipping list, to make sure that shipment is complete. After inspecting the unit, protect properly during storage or while moving it to the actual installation site. To maintain warranty protect unit against adverse weather, theft or vandalism on jobsite.

Take stock all the accessories and loose components that comes with the unit and compare it with the submitted order list

Damage to Units

Be sure to inspect the unit upon receipt for damage. If the unit has been damaged in transit, file a claim with the transportation company immediately and advise your insurance company immediately.

Be sure to inspect the unit upon receipt for damage. If damage is found, file a claim right away with the insurance company

Warranty

PETRA warrants all equipment and materials against defects in workmanship and materials for one year from initial start-up, or eighteen months from delivery (whichever occurs first) unless extended warranty has been agreed as part of the contract. All warranty claims must specify the unit model, serial number and order number. These details are printed on the unit identification plate. For warranty purposes, the following conditions must be satisfied:

The initial start of the unit must be carried out by trained personnel from an Authorized PETRA Service Center. All the scheduled maintenance operations detailed in this manual must be performed at the specified times by suitably trained and qualified personnel. Failure to satisfy any of these conditions will automatically void the warranty.

The warranty is void if the equipment is repaired or modified due to misuse, lack of maintenance or failure to comply with PETRA's instructions or recommendations. If the user does not conform to the above mentioned general notes, it may result in cancellation of the warranty.

SAFETY CONSIDERATION

Installation, start up and service of air conditioning equipment can be hazardous due to system pressures, electrical components and equipment location {roof, elevated structure…,etc.}. Therefore, only trained and qualified installation and service technicians should install, start up or service this equipment. We would like to remind you that failure to respect installation and maintenance instructions may void the unit warranty

Follow all safety codes

When working with the equipment, observe precautions in the literature as well as the tags, stickers and labels attached to the units.

Keep all doors and screws installed on unit while moving unit and installing ductwork. This will helpensure that the unit stays square, allowing for easier removal of doors after the ductwork is attached.

Before operating, be sure the unit is properly grounded to prevent injury or death from electrical shock.

Be sure to disconnect power before servicing this equipment.

DO NOT VENT refrigerant relief valves within a building. Relief valves outlet must be vented outdoors.

Wear safety glasses and work gloves.

Use care in handling, rigging and setting bulky equipment.

Keep quenching cloth and extinguishers nearby when brazing.

Do not tip units on their side during transportation or installation, or severe internal damage may occur.

Before driving screws into the cabinet, check on the inside of the unit to be sure the screw will not hit electrical or water lines.

INTRODUCTION

PETRA Residential Air-Cooled Liquid Chillers (RWC) with hermetic scroll or reciprocating Compressors and R22 or R407-c refrigerant, offers a wide range of sizes to meet the customer requirement for different applications within residential and commercial buildings.

PETRA RWC Chillers are designed to meet the customer requirement by offering state of the art Low sound, reliable , high energy efficient and small physical footprint chillers. The wide range cooling capacities and flexible installation arrangement makes it easy to install and maintain.

These Packaged air-cooled water chillers meet the same high engineering and performance standards that are characteristic of all **PETRA** Air Conditioning Systems

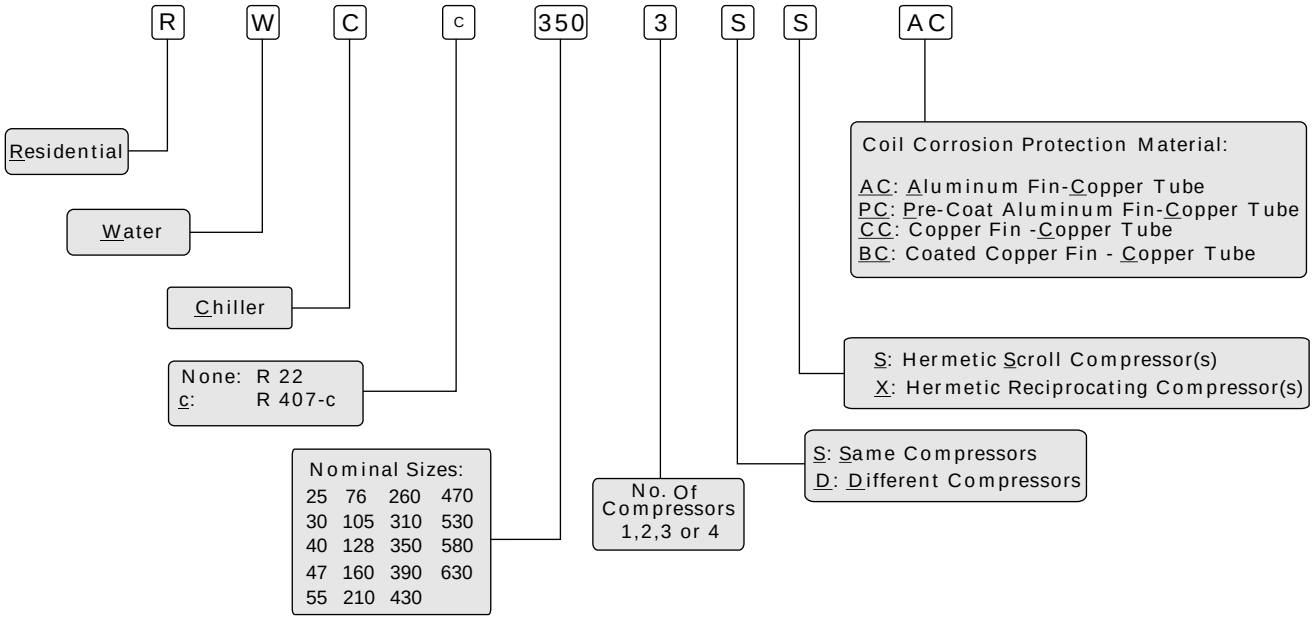
NOTE

This manual contains all the information required for correct installation of the unit, together with operating and maintenance instructions. This manual should be read thoroughly before attempting to operate or service the unit.

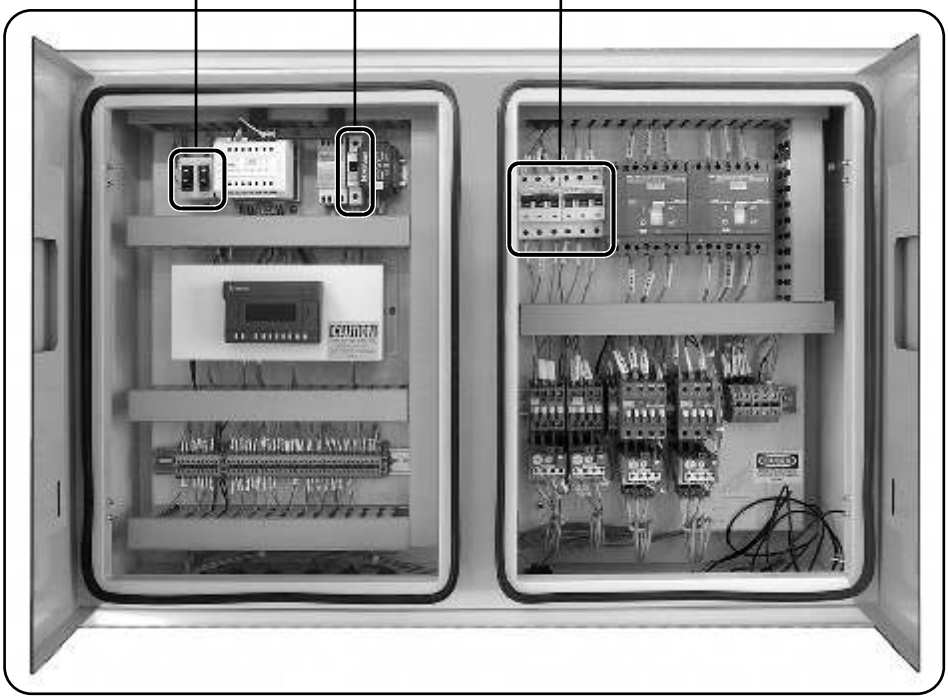
NOTE

For more technical details, please refer to the nearest Sales Office or **PETRA** Factory.

NOMENCLATURE



COMPONENTS DESCRIPTION



On/Off Switch

This device is used to connect and disconnect the power to the whole unit

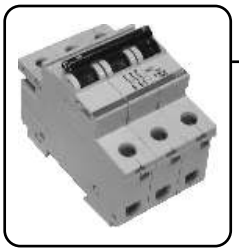
Control Circuit Breaker (CCB)

This device is incorporated in the unit as part of the control circuit to provide protection to the control circuit from a short circuit.

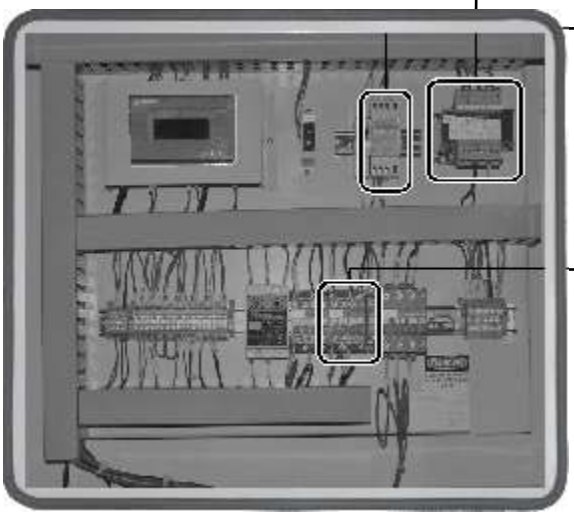
The crankcase heater of each compressor can be energized when this control circuit breaker is switched ON. It is highly recommended to energize the crankcase heaters of the compressors 24 hours before operating the unit for the first time

Power circuit breaker (PCB)

The function of the power circuit breaker is to provide protection from short circuit, for the whole unit or for each motor as well.



COMPONENTS DESCRIPTION



Control Transformer

Transform the voltage from primary voltage (220, 240 volt) into secondary voltage (24 volt)

ON/OFF Convertor

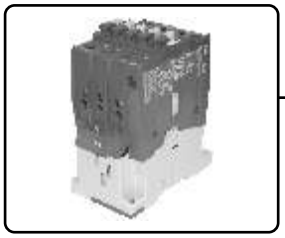
Converts a 10Vdc signal into an ON/OFF signal via relay, and it is used to connect and disconnect the fan

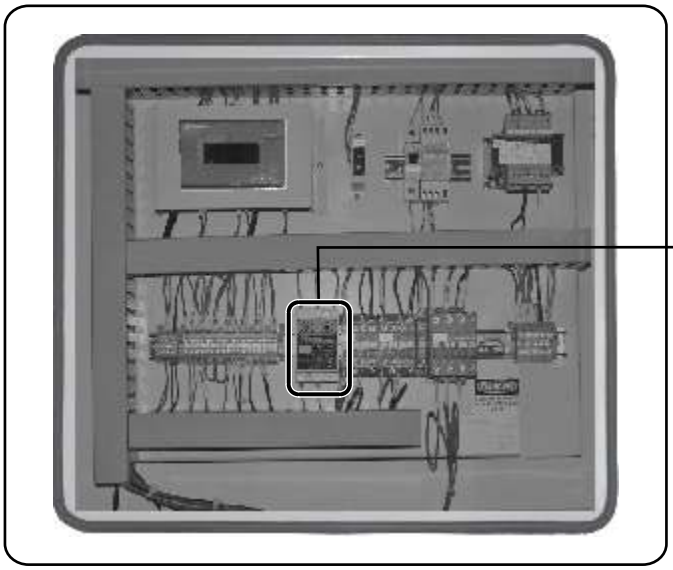
Contactor

The contactors are mainly used for controlling 3-phase motors.

NOTE

The unit should contain all the required contactors to start all motors such as (compressors, condenser fan motors).





Motor Saver

The function of this device is to protect the unit in the following conditions

- Phase sequence not suitable.
- Loss of one phase.
- Lower voltage.
- Variation between phases.

The controller will give an alarm signal in case any of the above condition occur, to indicate the fault condition. The PFR has a small indication LED to indicate its status as follow:

- **Green light:** to indicate the correct power supply and normal operation
- **Red light:** to indicate fault condition

CAUTION

If the unit was tripped on the PFR it should restart automatically after the cause of the trip has been eliminated.

- When turning on the power to the unit, the LED will alternate red and green until a start delay period is elapsed.
- Then the LED will turn solid green to indicate that the device energizes its output contacts and operates normally without any faults.
- In case of fault the LED will turn solid red to indicate that the device has been tripped and its output contacts don't energize.
- When cause/s of trip is eliminated the LED will alternate red and green until an automatic restart delay-period is elapsed, and then turn solid green to indicate the normal operating of the device.

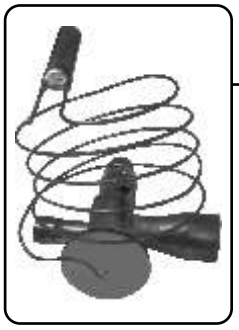
NOTE

- The under voltage tripping occurs at a deviation of 6% of the nominal voltage. (The automatic restart in this case is carried out when the deviation ratio becomes equal to 4.5% of the nominal voltage respecting the restart delay time).
- The device is automatically reset but the unit must be manually reset from the main Microprocessor Controller.

COMPONENTS DESCRIPTION

Thermostatic Expansion Valve

This device controls the superheat of refrigerant vapor at the outlet of the evaporator, it acts as a throttle device between the high pressure and low pressure sides of a refrigeration system and ensure that the rate of refrigerant flow into the evaporator exactly matches the rate of evaporation of liquid refrigerant in the evaporator. Thus, the evaporator is fully utilized and no liquid refrigerant may reach the compressor.

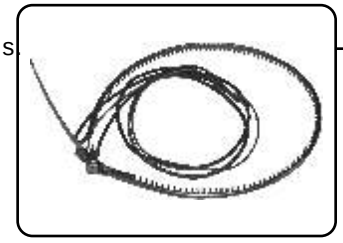


Service Valve

This is a manual valve located in the liquid line used for pump down applications and for liquid line accessories repair or maintenance.

Crankcase Heater

The heater minimizes the absorption of the liquid refrigerant by the oil in the crankcase during brief or extended shutdown periods.



The heater is located in the bottom cover of the compressor. The heater fixture must be tight to prevent it from backing out of the heater well. The heater eventually burns out if exposed to air for an extended period

Never open any switch that de-energizes the crankcase heater unless unit is being serviced or is to be shut down for a prolonged period. After a prolonged shutdown on a service job, energize the crankcase.

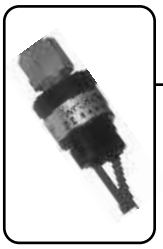
COMPONENTS DESCRIPTION

Pressure Switches

High Pressure Switch / (Manual Reset) ▶▶▸▸▸

The switch has fixed, non-adjustable settings, and is mounted in the discharge side of the compressor. The switch is provided to protect the compressor and the refrigeration system from unsafe high pressure conditions. If an unsafe high pressure condition should exist, the switch opens and shuts OFF the compressor.
The unit control module prevents the unit from restarting. Don't operate the unit on high pressure more than 410 psig).

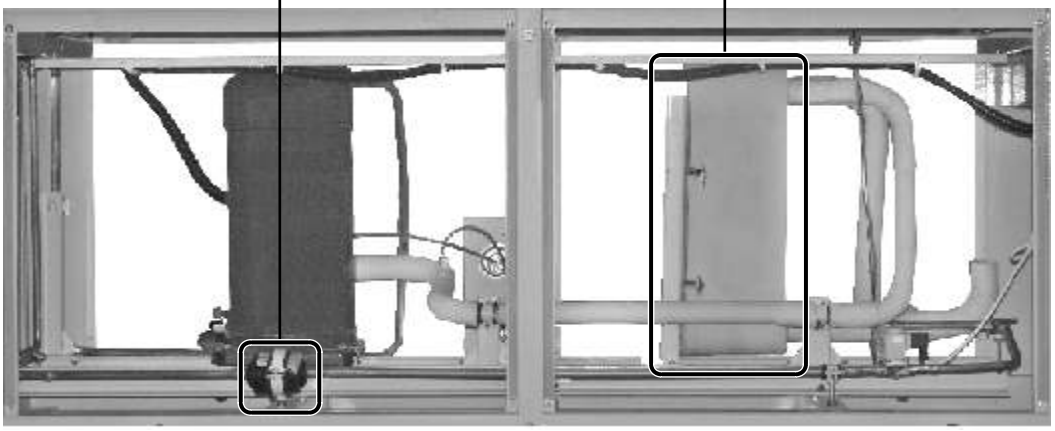
Low Pressure Switch / (Automatic Reset) ▶▶▸▸▸



This switch, which is mounted on the compressor has fixed, non-adjustable settings. It is of the automatic reset type.

Pressure Switches Limit Table	Cut Out	Cut In
High Pressure psig	410	275
Low Pressure psig	27	40

COMPONENTS DESCRIPTION

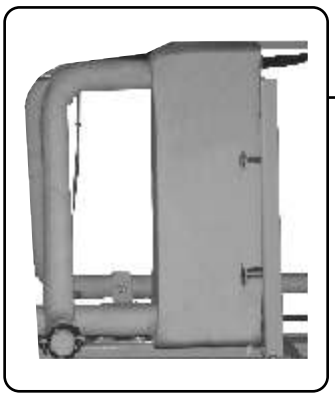


Filter Drier (Disposable Type)

Moisture will enter a system any time it is operated for field services. A filter drier is a very effective method for removing small amounts of moisture and contamination. It is installed in the refrigerant liquid line, so that all the refrigerant in the circulation passes through the drier, each time it circulates through the system.

Brazed Plate Heat Exchanger cooler (BPHE cooler)

Cooler The brazed plate heat exchanger is a complete heat exchanger which consists of stainless steel
plates, permanently brazed together with pure copper. The plates are stacked together and from flow
chambers for two fluids.
BPHE cooler is used for one stage application with allowable working pressure (maximum 435 Psi).
The cooler is insulated with 3/4" closed cell foam insulation.



COMPONENTS DESCRIPTION

Sight Glass (Option)

The sight glass allows the operator or service man to observe the flow of liquid refrigerant. It provides a warning signal in the event that moisture has entered the system, indicating that the filter should be changed or that some action needs to be taken to effectively dry the system. Clear flow of liquid refrigerant indicates sufficient charge in the system.

NOTE

Unit must be in operation at least 12 hours before moisture indicator can give an accurate reading. With the unit running, the indicating element must be in contact with the liquid refrigerant to give a true reading.

Solenoid Valve

This is normally closed with a de-energized coil solenoid valve and is fitted on the liquid line. The solenoid valve is opened when the compressor is ON and closed when the compressor is OFF.

Four-Way Reversing Valves (Optional For Heat Pump Units)

- Pilot operated 4-way reversing valves are suitable for heat pump application on unitary, spilt system type air conditioners, etc.
- 4-way pilot valve adoption has an advantage of reliable changeover operation and is a unique device for short cycle prevention.
- Designed for instantaneous reversing and operations under small minimum pressure differential between the high and low side. Pressure drop across the valve, and valve leakage are minimized.
- Provided with drip proof resin encapsulated solenoid coil.

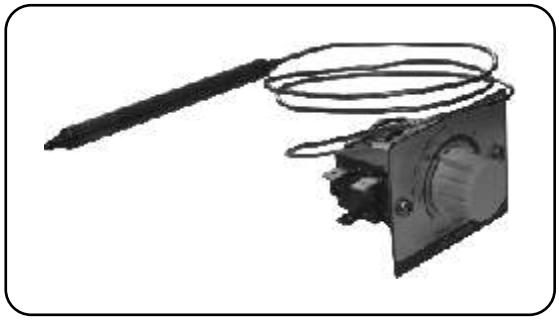
COMPONENTS DESCRIPTION

Suction Accumulator (For Heat Pump Option)

It's purpose is to protect the compressor from damage due to the sudden return of liquid through suction lines.
Compressors on many air-conditioning units are often subjected to this sudden return, resulting in broken valves, pistons, connecting rods, crank-shafts, blown gaskets or bearing failure.
The suction accumulator, will protect the compressor, although several pounds of refrigerant may suddenly return through the suction line it does not flood into the compressor. The liquid refrigerant is temporarily held in the suction accumulator and metered back to the compressor at a controlled rate, through the metering orifice.

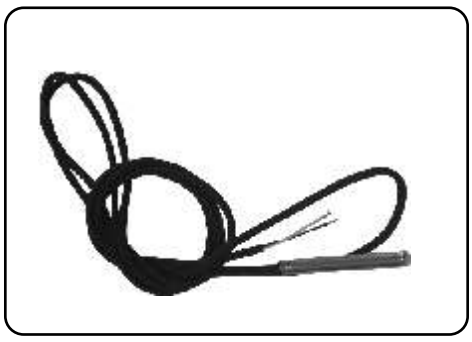
YTB Thermostat

This component used for ambient temperature from (15 - 30) C



Temperature Probe (Sensor)

Used to measure inlet/outlet temperatures accurately



Compressors

Piston Type Compressor

- Low sound compressors: with low discharge pulse levels which insures quiet operation.
- Hi efficiency: with high-energy efficiency ratings.
- Low foaming mineral base lubricant.
- Full maximum load rundown capability
- Internal inherent line break motor protection with start winding protection on single phase models.
- Crank case heater on all 3-phase models.
- Suction gas motor cooling.
- External baked enamel finish provides rust protection.
- Aluminum piston /cast-iron ring assemblies that provide reduced reciprocating mass and positive pressure seal.

Applications and specifications:

- All compressors used has the approval to operate as a heat pump compressor.
- The motor protector used inside the compressors is mounted internally and its proven design is the result of extensive laboratory research and field testing. It protects the motor from:
  - Maximum operating overload.
  - High voltage
  - Low voltage
- It is both current and heat sensing. It is wired at the connection point of the motor's three legs. Therefore the protector protects all three legs If a problem occurs with one or more of them, the protector will break all three phases (the single phase protector protects both the run and start windings).
- Rated load amps. Is the value used for contactor and other electrical component selection.

Compressors

Scroll Type Compressor

Low sound level:
Quieter system, lower applied costs (no sound blanket, no need for special compressor compartment).

- Scroll is the quietest compressor in it's range with the sound level of 6dB less than the hermetic reciprocating compressor.
- Very regular sound spectrum with no peaks (more sound comfort).
- Reasons:
  - Absence of dynamic suction and discharge valves.
  - Absence of reversing piston strokes.
  - Double compliance: the forces maintaining both scrolls in axial and radial, leak-free contacts depends on gas operating pressures; this prevents excessive contact load and associated noise.

Absence of shut-off noise:

More end-user comfort
- Immediate internal pressure balancing (high side - low side) at shut-off.

Low vibration and discharge pulses:

More durable system, lower applied costs (no need for discharge muffler), quieter system.
- Smooth, continuous compression process: absence of rapid piston motion.
- Each model supplied with rubber vibration absorbers.

High energy efficiency:
Lower energy costs
- C.O.P. averages 3.3, this is 5 to 15% more than reciprocating compressors.

Reasons:
- High volumetric efficiency (no dead space: no valve plate, no spiral tip-seals; leak-free compression due to double compliance).
- Minimized pressure losses: no valve plate, no internal suction and discharge piping; uniform gas compression in the scroll pockets at low velocities.
- Minimized heat transfer losses: physical separation of suction and discharge gas

High capacity at conditions where it is most needed (high ambient temperature in cooling mode and heat pump conditions):
More comfort in cooling and heating modes
- Reasons
  - High mass flow at high compression ratios (due to high volumetric efficiency).

High durability
Less failures
Reasons:
- Robust design: three Teflon impregnated bearings; integral cast-iron housing for better compressor alignment.
- IP 54 enclosure class of terminal box.
- Scroll inherent durability: few moving parts, low motor strains (always starts unloaded, low running torque required because compression and discharge is a continuous process).
- Spiral surfaces wear in, not out, due to unique compliant design.
- Solid state thermal motor protection (Motro Protector) is available.

High charge limit:
Low applied costs (no accumulator, no external check valve in discharge line).
Reasons:
- Large internal volume.

Protected under extreme conditions:
Reliable systems in rough applications
Reasons:
- Tolerant to returning liquid or debris (double compliance)

Suction screen.
- Centrifugal oil pump with filter.
- Solid state motor protection module.
- Protected against excessive pressure ratios (floating seals).
- Protected against excessive discharge temperature (internal temperature sensor located at discharge port of fixed scroll).
- Built-in non return valve in discharge spud

Compact:
Smaller unit
- Foot-print of 8.66*8.66 inch, one of the narrowest in the industry.

Serviceable:
Friendly user unit
- Pressure taps.
- Oil sight glass.
- Oil adjustment valve (schrader type).
- Du (PTFE) Journal Bearings

OUTSTANDING FEATURES

Superior Efficiency

RWC series exceed ASHRAE 90.1 new efficiency levels at both full load and part load efficiency.

Low Noise Chillers

RWC series offer a low sound power level chillers measured in accordance of BS IS0 3744 standard by adopting low noise scroll/reciprocating compressors and condenser fans and special design refrigerant piping.

Compact Physical Footprint

RWC offers a compact footprint to serve the areas and applications that have a space constrains and it is offer a close spacing installation.

Outstanding Finishing

- All exposed piping including coil headers are epoxy coated for extra protection and long life.
- All coils U-Bends are protected with a galvanized steel painted cover plate mounted at U-Bend coil side the plate covers the whole U-Bends coil side.
- All suction lines are covered with rubber insulation wrapped-in cheese clothes and epoxy painted for extra protection.

Quality Assurance

- To ensure the best performance, each unit is 100% factory run tested.
- RWC series is produced in ISO 9001-2000 listed manufacturing facility.
- RWC series are rated in accordance with ARI standard 550 / 590.
- RWC units construction comply with ASHRAE 15 safety requirements.

Easy Installation

Complete factory wiring, easy listing provisions, factory installed options and start up, facilitate quick and easy installation. A complete factory run test is performed on each unit.

Design Flexibility

Unit Capacities in this series have a wide range depending on design requirements. A wide choice of chillers capacities and options are available to meet the precise design requirements. The advanced microprocessor control enable the consumer to the advanced microprocessor control enable the consumer to select specific operating parameters according to particular needs.

SPECIFICATIONS

Compressor

The compressor used is a hermetic(Piston and Scroll type) refrigerant gas cooled with thermal overload protection in each phase. The terminal box is rain-tight, direct -on- line starting. With high performance and efficiency, low sound; so as to match all other Petra products' reliability and efficiency and with crank case heater for models RWC 40 and above.

Piston Type Compressor

Scroll Type Compressor

Air Cooled Condensers

PETRA's air-cooled condensers are designed to deliver their respective duties at optimum performance for all design conditions. Coils are manufactured from seamless copper tubes mechanically-expanded into aluminum fins. All coils are tested at 450Psi, air pressure, under water to avoid leakage.

They also undergo dry chemical cleaning after coil manufacturing for optimum system cleanliness.

Direct Driven, Condenser Propeller Fans

All condenser fans are of propeller (axial) type, which are directly mounted on the motor shaft. All fans run at approximately 900/1100 RPM @ 50/60Hz, for optimum fan efficiency and maximum sound power reduction. Fan blades are made of corrosion resistance material, and are statically and dynamically balanced before installation. This offers a low noise operation with high efficiency performance. All condenser fans are equipped with wire guards.

Condenser Fan Motors

All fan motors are of induction type totally enclosed air-cooled, squirrel-cage type, externally thermal over current protected and with class "F" insulation and IP 55.

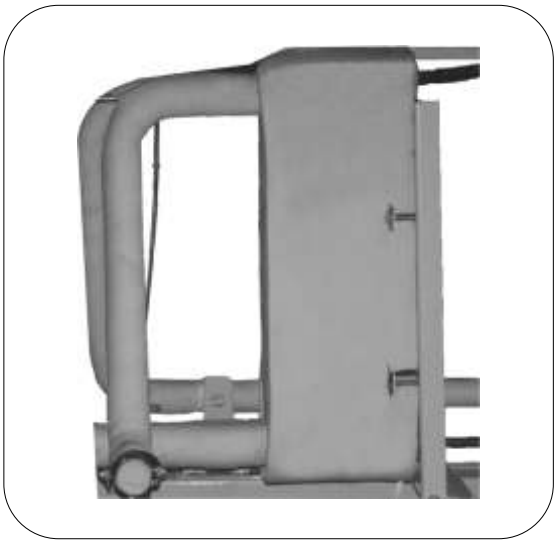
Fan Motor

Brazed Plate Heat Exchanger cooler (BPHE cooler)

Cooler The brazed plate heat exchanger is a complete heat exchanger which consists of stainless steel plates, permanently brazed together with pure copper. The plates are stacked together and from flow chambers for two fluids.

BPHE cooler is used for one stage application with allowable working pressure (maximum 435 Psi).

The cooler is insulated with 3/4" closed cell foam insulation.



BPHE cooler

Shell and Tube Cooler

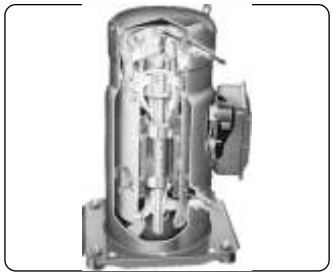
The cooler is shell and tube type with inner grooved copper tubes for two circuits and more. It is tested and stamped for refrigerant side working pressure of 360 Psi and a design waterside working pressure of 150 Psi. The cooler is installed with closed cell foam insulation. Coolers are ASME stamped.

Shell and Tube cooler

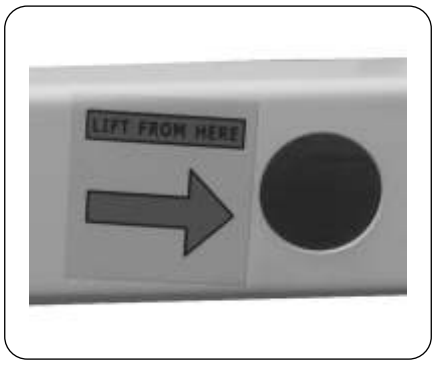
STANDARD FEATURES

Construction

- Easily accessible system components.
- Galvanized, formed sheet metal chiller base.
- Air-cooled condenser allows less installation space requirements.
- Easily accessible system components.
- Plastic mesh guard around chiller perimeter.
- Weather proof with ample space for easy access power and control panels.
- Hermetic suction gas-cooled compressor motor.



- Modular design with multiple compressor execution, provides flexibility for varying load conditions, and avoids total shut down of chiller during service of any of the refrigeration circuits.
- Heavy structure unit weatherproof electro-static polyester powder paint, oven baked for sheet metal and multi-epoxy coating for base frame.
- Heavy duty mounting chassis for whole unit, welded steel base with lifting lugs painted and epoxy coated.
- Anti-vibration mounts under compressor (Rubber-In-Shear Type).



lifting lugs

Rubber-In-Shear, Vibration Isolator
(Under Compressor)

Refrigeration

- Independent refrigeration circuit per each compressor.
- Fully charged unit with R22 or R 407c refrigerant.
- Liquid, discharge and suction pipes are all of type L hard copper pipes which formed using CNC high accurate pipe bending machine to minimize pipes brazed joints to increase system reliability.
- Epoxy paint for all exposed copper piping system of the refrigeration circuit.
- Expansion tank (one in system) - Loose item.
- Charging points with charge nipples.

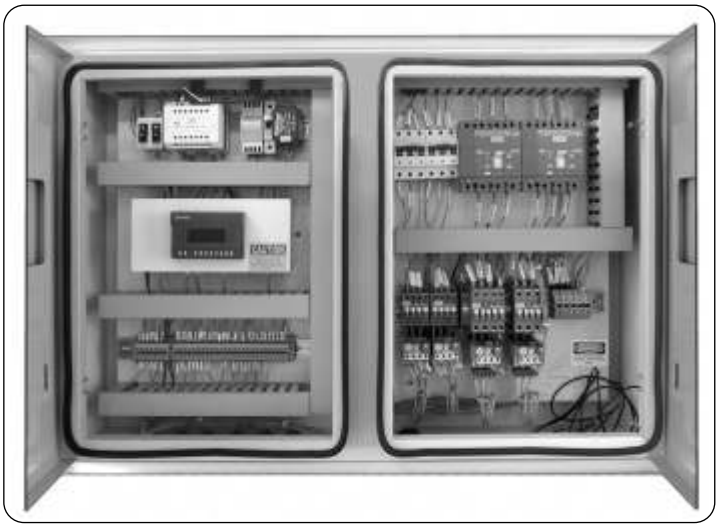
STANDARD FEATURES

- Each refrigeration circuit component:
  - Thermostatic Expansion Valve.
  - Liquid line solenoid valve.
  - Liquid line shut-off valve.
  - Disposable filter drier.
  - High/Low safety pressure switches (capsule type; factory pre-set).
  - Charging points with charge nipples.

Electrical

- Weatherproof Electrical Panel: All power and control components including the microprocessor controller shall be assembled inside electro-static polyester powder paint, oven baked -electrical panel with index protection of Ip55.
- Microprocessor control for full management of the chiller operation and safety circuits.
- Smart lead-lag operation for compressors.
- Short cycling protection for compressors (time delay).
- Freeze protection through water out probe.
- Low ambient based on ambient control down to 45°F by cycling fan (ON-OFF) for the units with 2 fans or more. For units with one fan, speed controller can be used as an optional feature.
- Control voltage is 220-240V for all components.
- Control transformer.
- On/Off switch for each compressor.
- Starting contactors for compressors and condenser fan motors.
- Direct On Line start.
- Inherent motor protection for each compressor.
- Inherent motor protection for each condenser fan motor.
- Control circuit breaker for short circuit protection.
- Key-Lock and door handle for electric panel.
- Control terminal strip for easy connection with electrical board and easy field installation.
- Free terminal for remote ON/OFF connection
- Free terminal for general alarm output.
- Power supply monitor (phase failure relay). (*For unit models RWC 76 and above).*
- Single point power connection for electrical panel (refer to electrical data tables).

Key-Lock and door handle



Electrical Panel (Power & Control)

Control Panel

OPTIONAL FEATURES

Construction

Chiller Sound Enhancement Options:

- There are 3 options to enhance the chiller sound pressure level;
  - Sound jacket kit for compressor.
  - Ultra low fan speed 720 rpm/900 rpm (50/60Hz) and compressor with compartment.
  - Special design fan blades with external rotor motor and compressor with Sound jacket kit.
- Coils Protection material
  There are 3 options for coils material:
  - Polyurethane pre-coat aluminum fins with copper tubes.
  - Copper fins with copper tubes.
  - Polyurethane post coat copper fins with copper tubes.
- Galvanized wire mesh guard around the chiller perimeter.
- Cooler cladding (For shell and tube coolers):
- Cooler cladding can be aluminum, stainless steel or polyester painted (22 gauge) galvanized steel.
- Cooler insulation:
  Cooler can be insulated with 1.5" or more thickness closed cell foam insulation.
- Chiller Vibration Isolation:-
  The following options are available for chiller vibration isolation:
  - Neoprene Rubber Pads.
  - 1" Spring isolator with restraints.
  - 2" Seismic Spring Isolators.

Refrigeration

- Heat pump chillers.
- Cooler tape heater:
  Factory installed heater to protect cooler from freeze-up at low ambient down to (-20°F).
- Ice storage option:
  Special chillers are available for this option, please consult the factory for more details .
- Glycol option:
  Used for applications requiring water outlet temperature below 40°F.
- Suction Accumulator.
- Liquid Receiver.
- External Pressure Relief Valve.
- Pressure Gauges (High + Low).
- Water flow switch Required as a safety interlock to prevent operating of unit without evaporator flow (available for field installation only).
- Moisture sight glass indicator.
- Heat reclaim, heat exchanger for hot water supply (de-super heat exchanger).
- None-standard water inlet and water outlet temperature range, which are needed for industrial applications.
- Brine application for low working temperature range.
- Other refrigerant application (R407c & R134a).
- Electronic expansion valve.

Electrical

- Microprocessor controller with seven day time schedule and/or serial output port.
- High entering water temperature protection.
- Automatic or manual pump down and/or pump out upon refrigeration circuit shutdown or start.
- Low ambient head pressure control by varying the speed of the condenser fan motor using speed controller or frequency inverter.
- External overload for each compressor.

OPTIONAL FEATURES

- External overload for each condenser fan motor.
- Earth leakage relay for each compressor.
- Earth leakage relay for the whole chiller.
- Ampere meter and/or voltmeter installed on electric panel door.
- Circuit breaker for each compressor.
- Circuit breaker for each condenser fan motor or each pair of condenser fan motor.
- Unit mounted fused or non fused disconnect service switch with external handle to isolate unit from power for servicing.
- Main power circuit breaker for whole unit with door isolator.
- Building automation system interface.

PETRA Can provide a full supervisory system for full monitoring of chiller operation. This includes hard ware devices and software program.

Main Function of Supervisory System

- Modification of control parameters of each single connected instrument.
- Local or remote supervisory system.
- User- friendly interface.
- Reading for the temperature sensor incorporated in the unit.
- Status of the unit (ON/OFF, alarm, stand by).
- Alarm management of the unit includes:
  - Display message with detailed alarm description.
  - Print out in real time of detected alarm.
  - Fax messages with alarm description and sender identification.
  - Transmission of telephone messages (GSM).
  - Unit set points.

PETRA Water Pumping Unit (PPU) with Buffer Tank

PETRA Pumping Unit (PPU) includes the hydraulic components necessary for chilled water for use with RWC units. The PPU are designed for easy connection and quick integration into chilled water system equipment, there by minimizing site labour requirements.

The PPU Provides the following standard features

- Heavy gauge galvanized steel casing, with polyester epoxy powder electrostatic paint, oven baked for outside use.
- Water pump with dynamically balanced impeller mounted directly into the motor drive shaft with mechanical seal to prevent leaks.
- Buffer tank, insulated with 0.75 inch thick rubber foam insulation for protection against freeze-up and reduce heat losses.
- Buffer tank, made of 0.12 inch galvanized steel to cover a wide range of applications, fitted with manual air vent, make up and drain.
- The whole pipe work assembly is insulated galvanized steel material.
- Expansion tank come in a closed vessel system, pressurized valve, protected by a cap, ensures that constant pressure is maintained in the system.
- Rubber mounted water pump.
- Two isolating valves.

OPTIONAL FEATURES

The PPU can also provide the following optional features

- Pressure gauges in the water pump inlet and outlet .
- Water strainer, built into the return water pipe .
- Globe valve to be installed on water pump discharge .
- Mixing tank for industrial applications and process .
- Contractor for each pump (mounted and wired in RWC electrical panel).
- External overload for each pump.

1. Water Out
2. Air Vent
3. Make Up
4. Water In
5. Drain

MICROPROCESSOR CONTROLLER

For more information about these controllers please refer to the PETRA Mark II and PETRA Mark VII-2 controller user's manual

PETRA'S microprocessor controller is engineered to meet the most demanding requirements of all control and data monitoring applications. It could be activated to perform different functions for cooling and heat pump applications.

However, in order to render the microprocessor control and peripherals easy to use by all skill levels of service teams, only necessary function for safety sequence of operation and alarm function are activated as standard.

In standard execution, while using the microprocessor for chiller control, it communicates with the standard conventional control such as, high pressure, flow switches, etc. thus allowing the service technicians to inspect and maintain such devices in the conventional manner.

Microprocessor controller is a standard feature on all units

PETRA Mark II Controller

Advantages ▶▶▸▸▸

(For units including 1 or 2 Compressors)

- Extremely compact dimensions
- Excellent reliability
- Icon ergonomic display
- Simple wiring.
- Modular architecture.
- Power ON indication light.
- Connection to remote terminals.
- Built in real time clock card.

- Temperature reading °C or °F.
- Flash memory to prevent data loss in case of power failure.
- Modification of the fundamental operating parameters (set points, differentials, alarm thresholds, time settings) password protected access levels.
- Built in keypad, LED display.

MICROPROCESSOR CONTROLLER

Main Functions ▶▶▸▸▸

- Temperature control on water inlet.
- Fan control.
- Complete alarm management.
- Compressor Time Management.
- Pump Management.
- Automatic lead/Lag function.
- Auto restart after power failure.
- Connection to remote terminals
- Pump Time Management
- Temperature reading °C or °F
- Anti-Recycling timer, to limit number of compressor starts per hour.
- Smart defrost management (for optional heat pump units only).

Displayed Data ▶▶▸▸▸

- Compressor and Fan status.
- Compressor operating hours.
- Pump operating hours.
- Chilled water temperature (leaving and entering).
- Ambient temperature.

Head Pressure Control ▶▶▸▸▸

- By (ON/OFF) condenser Fan (standard).
- By providing analogue output signals for fan speed controller (Optional).

Alarm Management ▶▶▶▸▸▸

- Trip indication light.
- Visible alarm code.
- Anti freeze function.
- High, low-pressure alarm.
- Compressor thermal alarm.
- Flow switch or pump interlock alarm.
- Anti-frost alarm.
- Probe error alarm.
- Condenser fan motor alarm.

Devices Controlled ▶▶▸▸▸

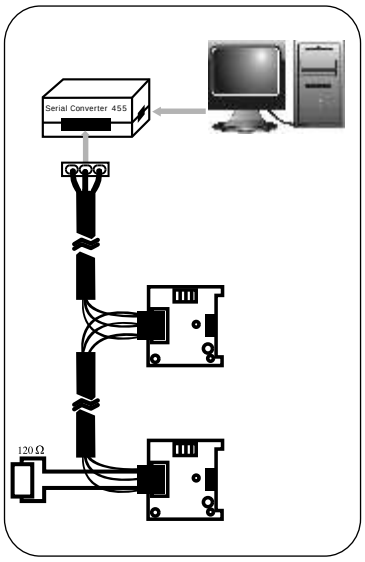
- Compressors
- Condenser fans
- Reverse cycle valves
- Water pumps
- Anti-freeze heaters
- Alarm signaling device

Remote Control (optional) ▶▶▸▸▸

Extended wall mounted display for remote control up to 492 ft.

External communications (optional) ▶▶▸▸▸

- RS 485 interface card to connect the controller to a supervisory network
- Petra software to communicate with a remote control room through modems for monitoring and controlling the unit providing complete supervision for all functions, setting and alarm condition



Advanced PETRA Controller

Advanced Petra Controller (For units including more than 2 Compressors)

Advantages ▶▶▸▸▸

- Built in keypad, ease of use with 4row/20column LCD display.
- Built in real time clock.
- Multi-language management.
- Modification of the fundamental operating parameters (set points, differentials, alarm thresholds, time settings) password protected access levels.
- Daily, weekly and holidays management.
- Extended wall mounted display for remote control up to 492 ft. (with external keypad only) (optional).
- Direct printer connection (optional).
- Demand limiting function (optional).
- External set point reset (optional).

Main Functions ▶▶▸▸▸

- Temperature control on water inlet/outlet.
- Smart defrost management (for optional heat pump units only).
- Fan control.
- Complete alarm management.
- Compressor Time Management.
- Pump Management.
- Automatic lead/Lag function.
- Anti-Recycling timer, to limit number of compressor starts per hour.
- Daily, weekly and holidays management.
- Demand limiting function (optional).
- Automatic Pump down (optional).
- External setpoint reset (optional): due to external analogue signal for
- remote modification of setpoint (4-20 mA or 0-10 Vdc).
- Forcing device ON/OFF (refer to manual operation).
- Auto restart after power failure.

Displayed Data ▶▶▸▸▸

- Unit Status.
- Freon Type.
- Unit Cooling capacity (T.R).
- Compressor and Fan status.
- Compressor operating hours.
- Compressor starts number
- Pump operating hours.
- Compressor Ampere reading (Optional).
- Compressor Suction/Discharge Pressure readings (Optional).
- Chilled water temperature (leaving and entering).
- Ambient temperature.
- Value of analog output (fan inverter) (Optional).
- Compressor Suction/Discharge Temperature readings (Optional).
- Status of high and low pressure switches.
- Status of water flow switch.
- Status of all inputs and outputs
- Automatic Pump down (optional).

Alarm Management ▶▶▸▸▸

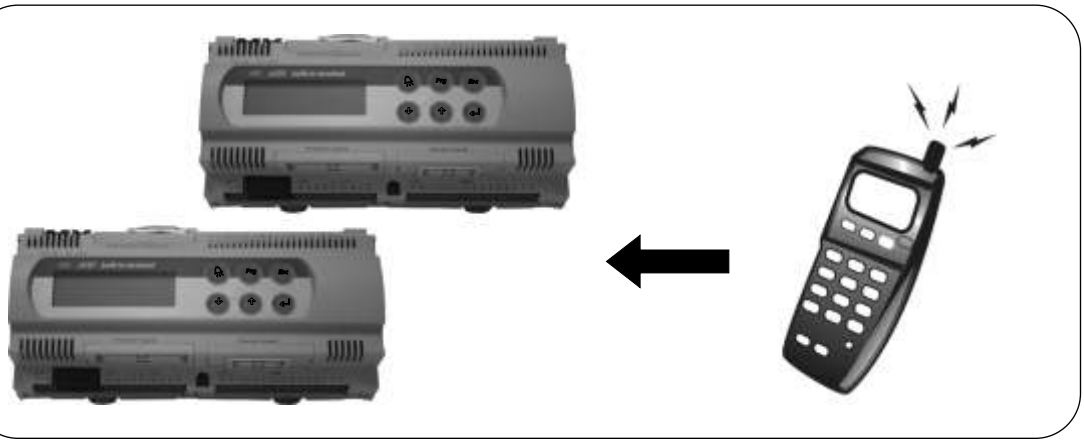
- Alarm history.
- Visible full text alarm message.
- High / low ambient temperature protection.
- Anti freeze function.
- High ΔT protection (across cooler) to prevent unit from working under low evaporator flow.
- Trip indication light.
- High, low-pressure alarm.
- Compressor thermal alarm.
- Flow switch or pump interlock alarm.
- Anti-frost alarm.
- Probe error alarm.
- Condenser fan motor alarm.
- Water out high/low temperature.
- Water in high/low temperature.

Devices controlled ▶▶▸▸▸

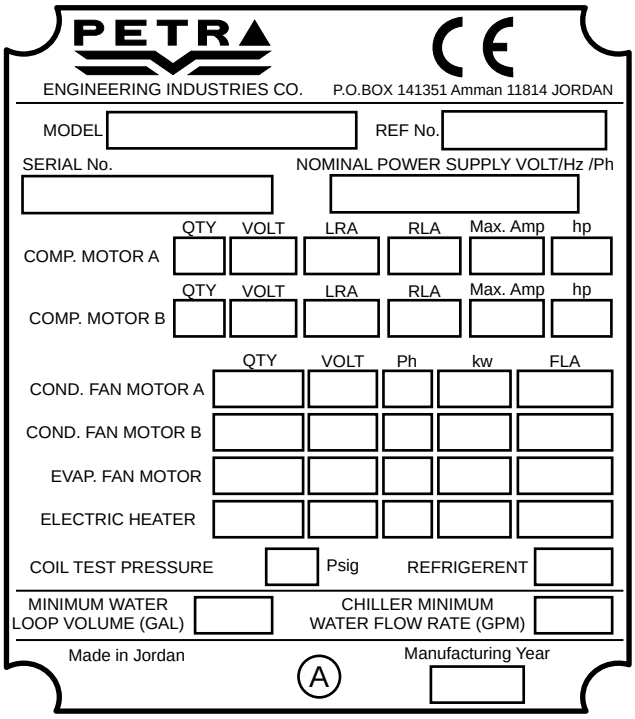
- Compressors.
- Condenser fans.
- Reverse cycle valves (for optional heat pump models).
- Water pumps.
- Anti-freeze heaters.
- Alarm signaling device.
- Liquid line solenoid valves (optional for Automatic Pump Down).

External communications (optional) ▶▶▸▸▸

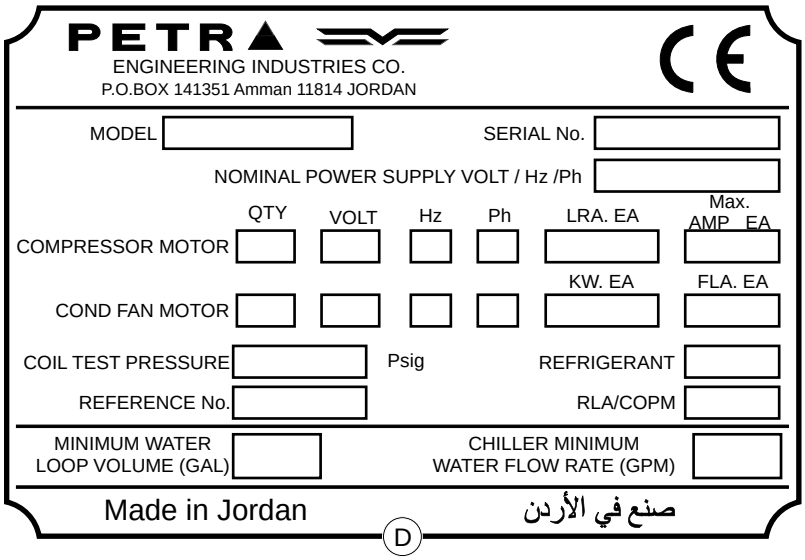
- Building Management System using different protocols (BacNet, MODBUS, Johnson Controls Metasys and LON Talk).
- Building Management System using digital inputs and outputs (Hard wire).
- GSM Protocol allows sending and receiving SMS messages, which
- could be used for signaling active alarms and resetting them where possible
- using a GSM mobile phone.
- RS485 serial board for Supervisor and Tele-Maintenance.
- RS232 Modem interface card.



NAMEPLATE DESCRIPTION



RWC Nameplate with difference compressor



RWC Nameplate with similar compressor

NOTE

When the unit arrives, compare all nameplate information with the data of submitted order.

Loose Part Check

Loose items appearing on the submitted order list should be inspected to verify receipt of the correct quantity of each. Typical items to check in RWC are listed below:

- Expansion tank

- Water switch (optional)

Storage

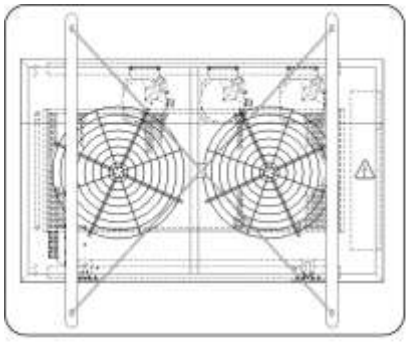
If the RWC units are to be stored, before installation, it is important to take the following precautions:

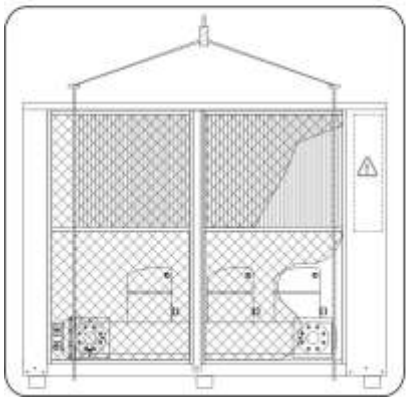
- Keep the unit in a safe area, away from the construction site in order to maintain the integrity of the unit.
- Keep the protective packing of the unit until it is finally installed. If the packing is torn or lost, protective covering should be provided to avoid subjecting the unit to site and weather conditions, and manipulation.
- It is recommended that the unit is periodically inspected during storage

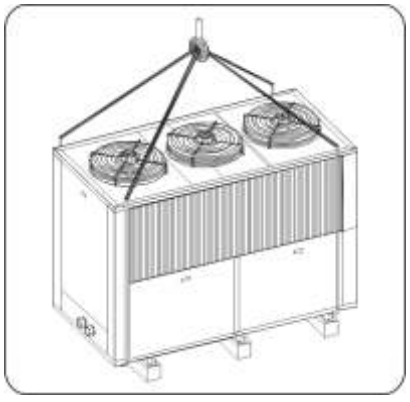
Moisture, debris, and minerals can cause permanent damage to the components

Unloading

These units are designed for overhead rigging. So for proper unloading and handling, a suitable crane is needed. Use wear flex slings. All units are supplied with lifting lugs on base sides, spreader bars should be used to keep cables or slings clear from the unit sides to avoid damages for unit frame.







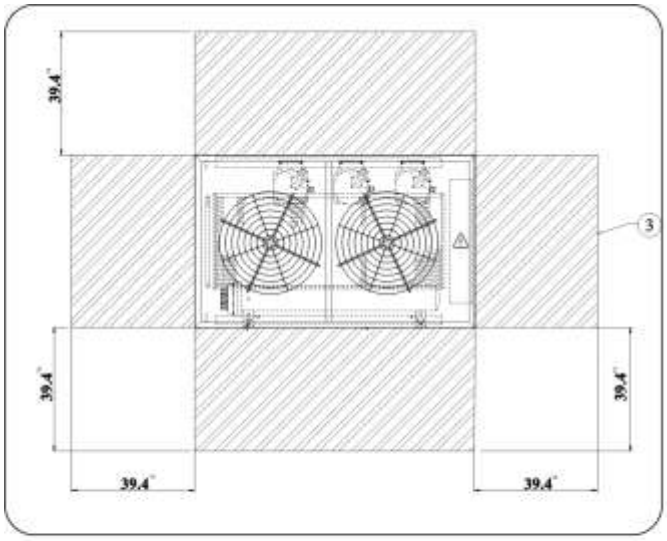
CAUTION

Do not use metal slings to lift the machine because it might damage the unit. Use wear flex slings and do not use forklift trucks on the units

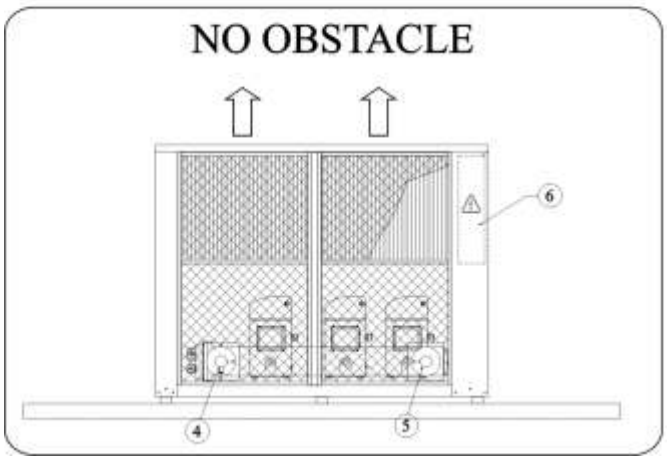
Operating Space

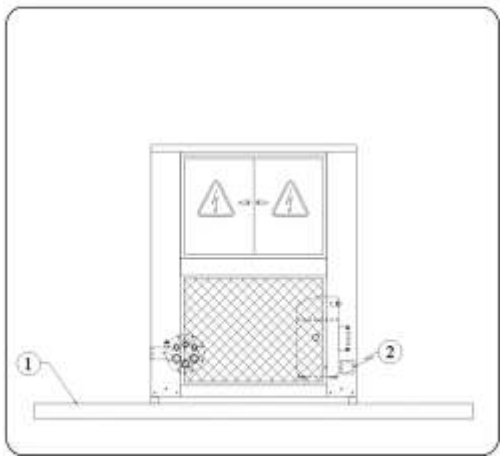
When installing the unit consider the followings:-

- Foundation should be made of flat-leveled concrete or steel stand.
- Free space beside the condenser coil.
- Free space on both sides of the unit for service and maintenance (if there is no barrier on adjacent wall).
- Free space of not less than 3 meters above the condenser fans should be available.
- Once the unit is in place. Check again that the unit is leveled.



1. Flat Leveled Foundation
2. Electric Inlet
3. Free Space For Service
4. Water in
5. Water out
6. Electric Box





Site Requirements

To achieve optimum performance and free maintenance it is essential to prepare an installation site meets with the location and space requirements for the model being installed.

The unit site should be selected for minimum sun exposure, and far away from any source that may attack any parts of the unit.

PETRA is not responsible for equipment problems resulting from an improperly designed or construction foundation.

RWC units may be locate as two type:

- Ground Level Units
- Roof Mounted Units

RWC must be installed with adequate vibration isolation beneath the unit to prevent any vibrations, which is might be transmitted to the building.

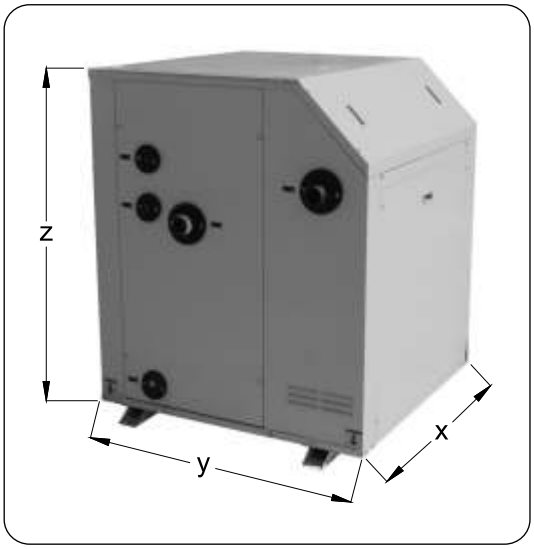
Do not locate the RWC unit beside or closed to other building or large building, because it might reflect the sound back, this may attack the sound sensitive receiver.

On rooftop locations, RWC should locate on a place with adequate structural strength to tolerate its weight and to be more safe for the whole building.

Installation

- Establish position where unit is to be installed; make four holes in the ground for double-thread anchor bolts. Place the unit properly and fix into the anchors. Make sure the unit is properly leveled.
- Install and connect pipes between the RWC unit and your system as follows:
  - If the RWC is ordered with system water circulating pump you just have to connect the supply and return pipes
  - If the RWC is ordered without system water circulating pump, selection of pump is based on water flow rate (gpm) and total pressure drop in system.

Petra Pumping Unit (PPU)



PPU MODEL	X (mm)	Y (mm)	Z (mm)
PPU75	700	790	900
PPU100	700	790	900
PPU125	1000	1000	1150
PPU150	1000	1000	1150
PPU200	1000	1000	1150
PPU250-1	1000	1000	1150
PPU300	1000	1000	1150

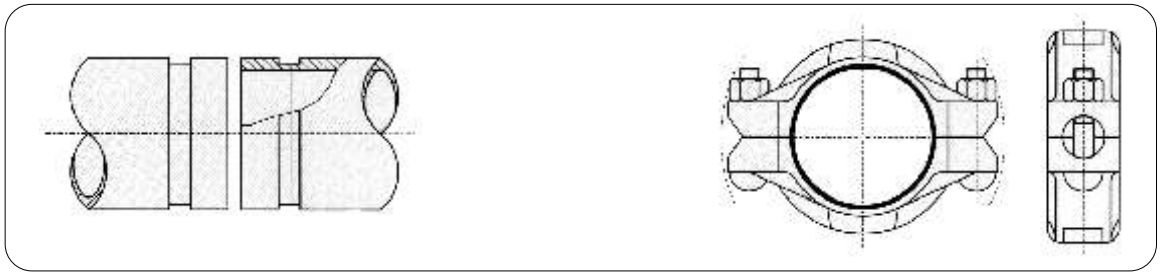
PPU MODEL	Water Connection Size (in)	RWC unit	PPU MODEL	Water Connection Size (in)	RWC unit
PPU75	0.50	RWC 25	PPU200	1.25	RWC 160
PPU100	0.50	RWC 30	PPU200	2.00	RWC 210
PPU125	0.75	RWC 40-55	PPU250	2.00	RWC 260&310
PPU150	1.00	RWC 76	PPU300	2.50	RWC 350-470
PPU150	1.25	RWC 105&128	PPU300	3.00	RWC 530-630

Mechanical Connection

Chilled Water Piping

Once the unit has been located in its final position, the chiller water piping may be connected.

- Stop valves should be installed in all lines to facilitate servicing.
- Flexible connections should be installed on the cooler inlet and outlet to prevent transmission of water pipe vibration.
- Drain connections should be provided at drain connection of the cooler for complete drainage of the cooler.
- Air vent or small valves should be installed on the cooler to facilitate servicing for water or fluid flow balancing. Locate valves in the return and supply cooler water of fluid lines as closed to the cooler as possible.
- A strainer must be installed in the cooler inlet line just ahead of the cooler. This is important to protect the cooler from entrance of large particles which could cause damage to the cooler. (Recommended 40 mesh strainer)
- Thermometers and pressure gauges could be installed in the inlet and outlet water lines.
- A chilled water flow switch could be installed in the leaving water piping of the cooler. There should be a straight horizontal run of at least 5 diameters on each side of the switch. Choose the right size of the flow switch blade which complies with the pipe in which its installed. The switch to be wired to terminals located in the control panel, as shown on the unit's wiring diagram.
- **PETR**'S cooler could be supplied with two types of water or fluid connections:
  - A threaded male connection for small size cooler.
  - A flexible connection.
- Upon receiving the chillers, check the type of connections. If it is of the threaded connection type, use an adaptor of the same cooler inlet and outlet sizes and connect directly. The other connection is a flexible connection with clamps after installing the flexible joint, apply a suitable weld to connect the water or fluid pipe to the flexible connection.



Connection Pipe

Flexible Joint

Threaded male connection

All piping works to and from the cooler must be designed taking into considerations the followings:

- Piping should be kept free of all foreign matters.
- Avoid elbows, tees, and valves which decrease the pump capacity. All piping should be kept as straight as possible.
- All piping must be supported independent of the chiller.
- The chilled water piping system should be laid out so that the circulating pump discharges directly into the cooler. The suction for this pump should be taken from the piping system return line.
- Flushing the chilled water piping from any foreign material before the system is placed into operation, should be done without cooler connection to the system.

Don't flush any foreign material into or through the cooler; it should be done without cooler connection to the system.

- Size of Piping:

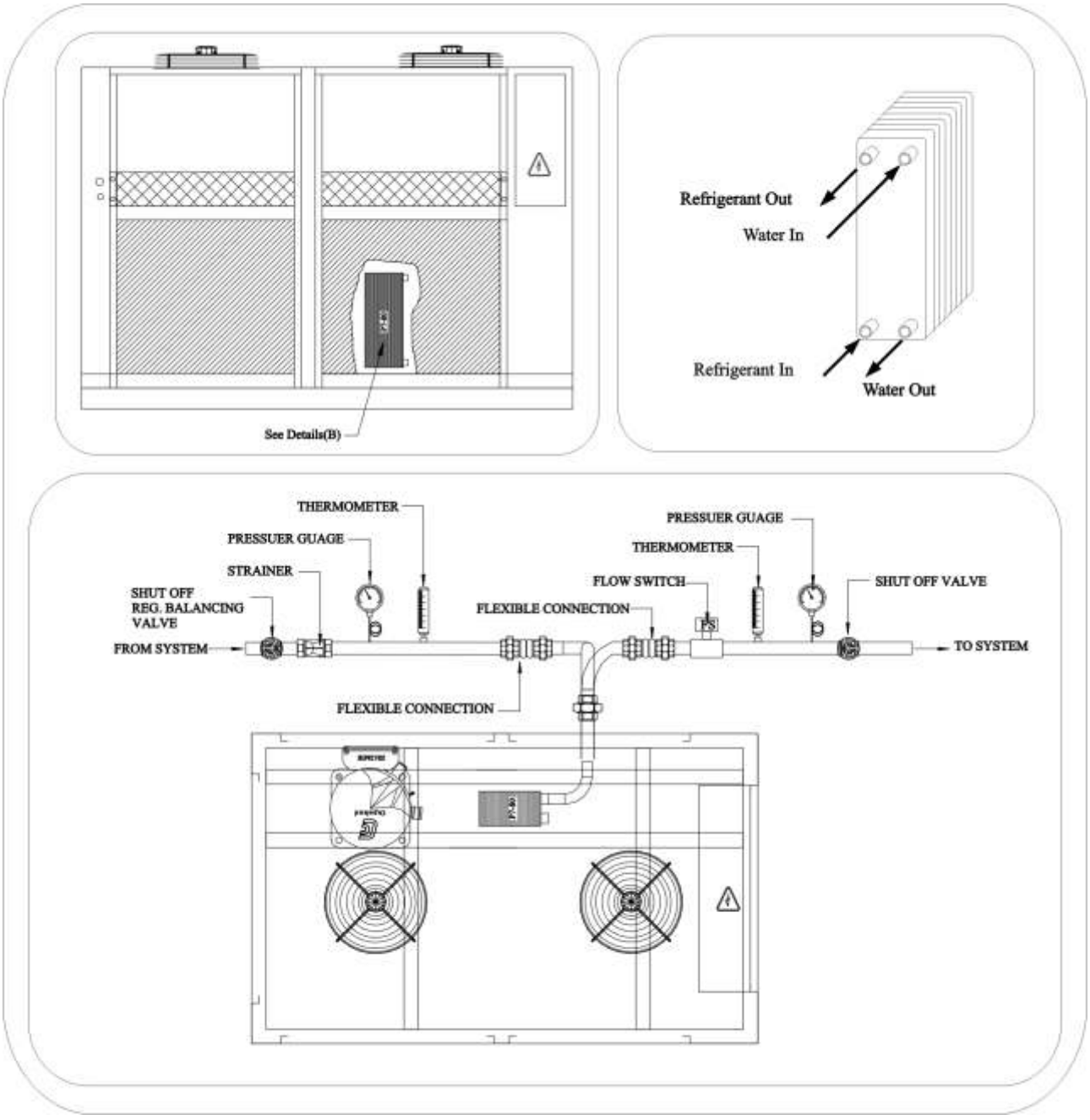
RWC Models	Water Connection Inlet/outlet	
	50 Hz	60 Hz
25	1.25"	1.25"
30	1.25"	1.25"
40	1.25"	1.25"
47	1.25"	1.25"
55	1.25"	1.25"
76	1.25"	1.25"
105	1.25"	1.25"
128	1.25"	1.25"
160	1.25"	1.25"
210	2.00"	2.00"
260	2.50"	2.50"
310	2.50"	2.50"
350	3.00"	3.00"
390	3.00"	3.00"
430	3.00"	3.00"
470	3.00"	3.00"
530	3.00"	3.00"
580	3.00"	3.00"
630	3.00"	3.00"

▲ Minimum Flow Rate RWC

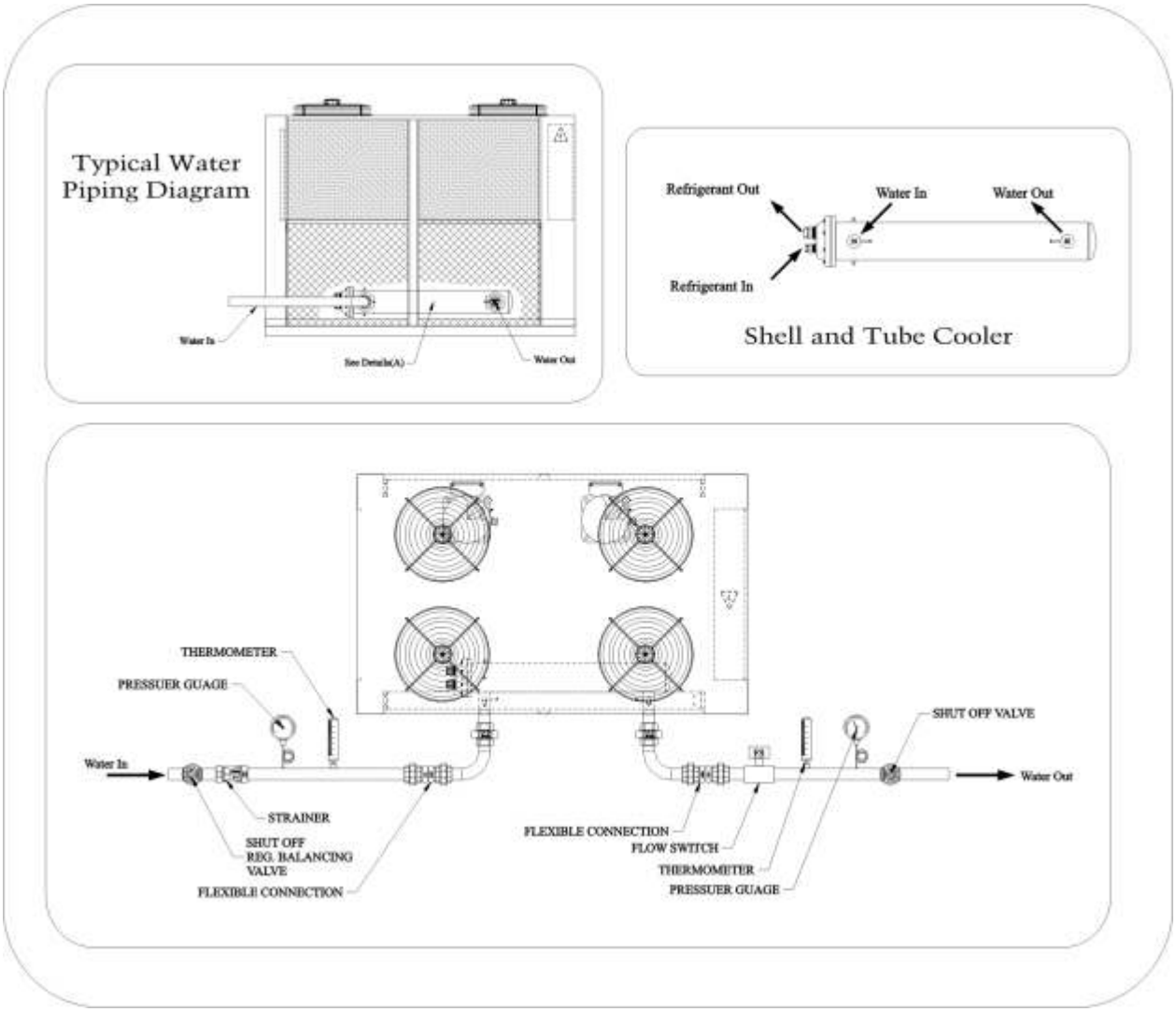
Model RWC	Minimum Cooler Flow Rate [GPM] 10.0 F Water Temp. Diff. Between inlet & outlet Water Temp.		Minimum Loop Volume [Gallon]	
	50 Hz	60 Hz	50 Hz	60 Hz
RWC-25	3	4	24	27
RWC-30	4	4	28	31
RWC-40	5	6	37	43
RWC-47	6	7	42	47
RWC-55	7	8	48	56
RWC-76	9	11	66	77
RWC-105	13	15	93	110
RWC-128	17	19	120	141
RWC-160	19	22	137	159
RWC-210	25	30	184	220
RWC-260	35	41	250	297
RWC-310	39	46	285	332
RWC-350	44	52	320	379
RWC-390	50	60	365	432
RWC-430	52	62	377	447
RWC-470	57	67	417	486
RWC-530	65	80	473	578
RWC-580	71	84	518	609
RWC-630	78	91	564	658

▲ Minimum Flow Rate RWCc

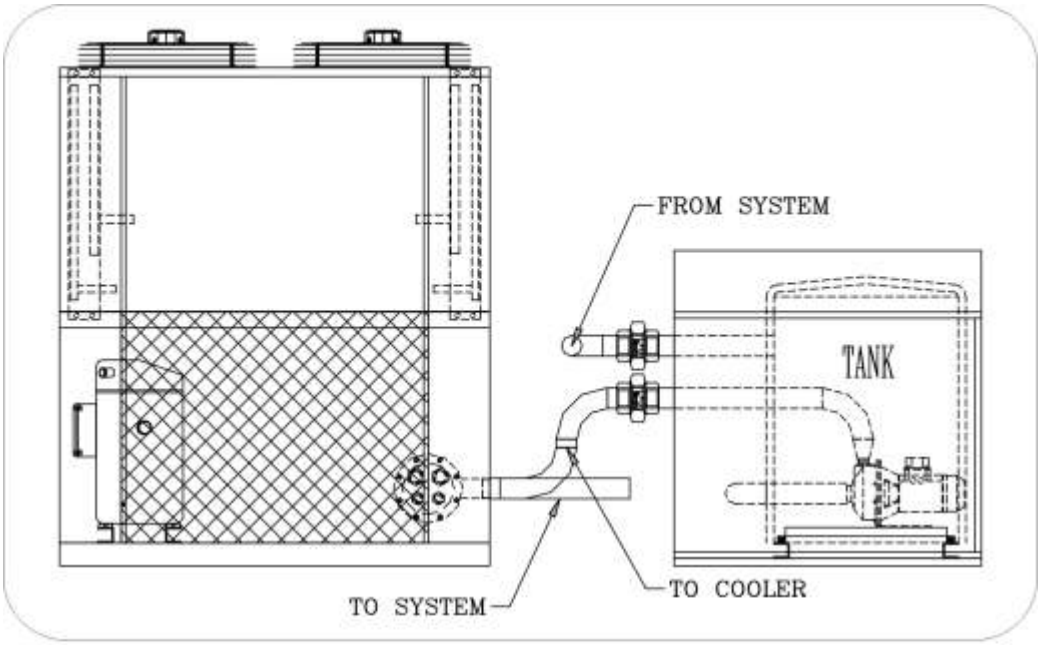
Model RWCc	Minimum Cooler Flow Rate [GPM] 10.0 F Water Temp. Diff. Between inlet & outlet Water Temp.		Minimum Loop Volume [Gallon]	
	50 Hz	60 Hz	50 Hz	60 Hz
RWCc-25	3	4	23	27
RWCc-30	4	4	27	32
RWCc-40	5	6	36	41
RWCc-47	5	7	37	48
RWCc-55	6	7	47	54
RWCc-76	8	10	61	75
RWCc-105	12	15	87	110
RWCc-128	16	20	118	143
RWCc-160	19	22	136	160
RWCc-210	24	29	177	211
RWCc-260	34	40	245	288
RWCc-310	38	45	275	325
RWCc-350	43	51	309	369
RWCc-390	49	58	358	420
RWCc-430	51	60	371	435
RWCc-470	56	65	406	473
RWCc-530	65	78	469	568
RWCc-580	70	82	507	597
RWCc-630	76	89	550	644

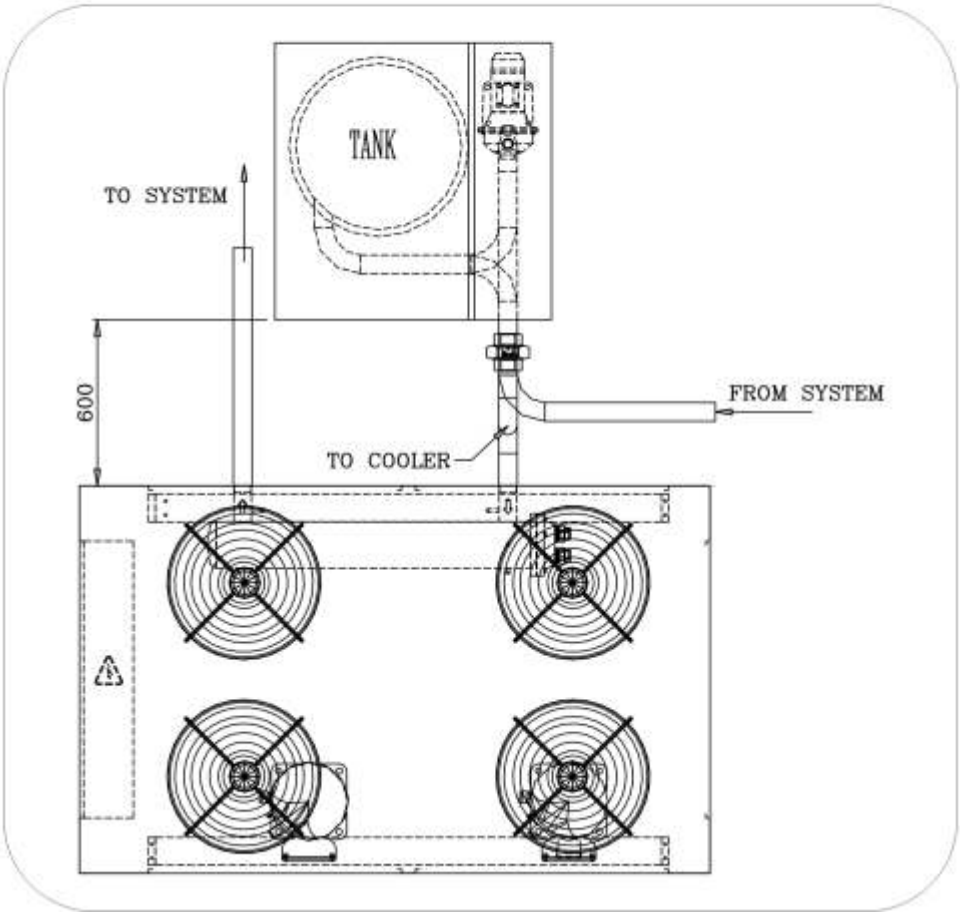


RWC
with brazed plate cooler



RWC
with shell and tube cooler


FROM SYSTEM
TANK
TO SYSTEM
TO COOLER


TANK
TO SYSTEM
600
FROM SYSTEM
TO COOLER

Electrical Connection

Power ▶▶▸▸▸

- Power wiring must be provided through molded case circuit breaker (MCCB) or fused disconnecting switch with the recommended rating (refer to electrical data tables) and according to the local code requirements.
- Each unit is provided with an electrical cable inlet to supply the unit with the specified power rating. By referring to the nameplate, you can check the maximum operating current, voltage supply and operating frequency.
- The unit should be grounded in accordance with the local codes.

Control ▶▶▸▸▸

- Each chiller is provided with terminal strip for easy connection of external devices to the control panel.
- Some external devices should be connected in the field such as (water flow switch, auxiliary contact from the chilled water pump starter, general alarm signal, etc.). These signals should be interlocked with the control panel as illustrated in the electrical control diagram.
- Refer to the wiring diagram attached with the unit for interlocking signals with the control panel. External devices that should be field installed indicated by dash dot lines in the wiring diagram.

- R.S. Terminal

  These two terminals can be used for remote control (enabling/disabling) of the unit and can also be connected with the B.M/System. These terminals must be jumpered if they are not intended to be used (as indicated on wiring diagram)

These two terminals should be connected to volt-free contacts

- General alarm terminals

  These two terminals can be used for the remote fault indication which can also be used with the B.M System to indicate the faulty of the unit. These terminals are potential free terminals.

- W.F.S (Water Flow Switch)

  These two terminals are available in chiller units, and must be connected without any voltage (potential free terminal). These terminals exist to protect the unit from starting without the correct water flow.

- P.I Terminal (pump interlock)

  These two terminals are available in chiller units, and must be connected with the auxiliary contact at the pump controller. These two terminals exist to ensure that the chiller starts only after the pump has started..

Before Starting the Unit

- Check the electrical connection for tightness.
- Switch on the main power supply.

Use the following formula to determine the present voltage imbalance.

Example: Present Voltage Imbalance

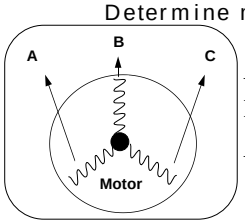
$$\frac{100 \times \text{Max. Voltage Deviation}}{\text{Average Voltage}}$$

Supply Voltage = 460 volt/3ph/60Hz
AB = 463 volt
BC = 462 volt
AC = 460 volt

Average Voltage $= \frac{463+456+458}{3}$

$= 459$ volt

Determine maximum deviation from average voltage:



AB = 463 − 459 = 4v
BC = 462 − 459 = 3v
AC = 460 − 459 = 1v

Maximum deviation is [4v]. Determine present voltage imbalance:

Voltage imbalance $= 100 \times \frac{4}{459} =$ 0.87 %

The amount of phase imbalance is satisfactory, as it is below the maximum allowable phase imbalance value [2%]

NOTE Contact your local electric utility company immediately, if supply voltage phase imbalance is more than 2%.

Check that the voltage monitor [Phase Failure Relay Lamp] is ON, and check that the setting is as specified on the nameplate. Switch the control circuit breaker ON to energize compressor crankcase heater.

NOTE Crankcase heaters are wired in the control circuit, so they are always operable when the control power supply disconnect is ON, even if any safety device is open or the unit switch is in the OFF position.

IMPORTANT Start unit under supervision of qualified service technician

First Operation Checklist

Petra Engineering Industries Co.

Running Check List

PETRA

PR 6.3

Project Name:	**Serial No:**	**Country :**
Project No:	**Model No:**	**Date:**

Operation Conditions				Main Components	
1- Unit Operation Mode		Heating		Exp.Device Model:	
2- Running Time After Stabilization				Shell &Tube Model:	
3- Pressure Drop At Cooler (PSI)		Design		Compressor model	
4- Evaporator Flow Rate (CFM)		GPM		1)	6)
5- Condenser Flow Rate (CFM)		GPM		2)	7)
6- Ambient Temperature (°C/°F)				3)	8)
7- Compressor Running Operation		Partial		4)	9)
8- Frequency 50 Hz		60 Hz		5)	10)
9- Entering Wet Bulb Temp. (°C/°F)				Cooler S.N:-	
10- Leaving Wet Bulb Temp. (°C/°F)				Condenser S.N:-	
11- Humidity %					

Refrigeration Test Readings	stage 1	stage 2	stage 3	Stage 4
1- Refrigerant Charge Type [ ] Weight (kg)				
2- Condenser Inlet Temperature (°C/°F) (Air / Water)				
3- Condenser Outlet Temperature (°C/°F) (Air / Water)				
4- Evaporator Inlet Temperature (°C/°F) (Air / Water)				
5- Evaporator Outlet Temperature (°C/°F) (Air / Water)				
6- Discharge Pressure (Psig)				
7- Liquid Line Pressure (At Shut Off Valve) (Psig)				
8- Suction Pressure (Psig)				
9- Discharge Temperature (°C/°F)				
10- Liquid Line Temperature (Befor Exp. Valve) (°C/°F)				
11- Suction Temperature (°C/°F)				
12- Sub Cooling (°C/°F)				
13- Evaporator Superheat (°C/°F)				

Electrical Test Readings	R-S [ ]	R-T	S-T		
1- System Voltage At Test ± 10% :					
2- Compressor Running Amp.					
3- Condenser. Fan Motor Running Amp.					
4- Evaporator Blower Motor Running Amp. (Supply)					
5- Evaporator Blower Motor Running Amp. (Return)					
6- Earth Continuity Ok Not Ok					
7- Insulation Test Ok Not Ok					

Stg.1
Stg.2
Stg.3

Measuring Instruments				
1-Low Pressure Gauge Serial No.:				
2- High Pressure Gauge Serial No.:				
3- Clamp Meter Serial No.:				
4- Air Velocity Meter Serial No.:				

Approvals

PTG Engineer: ***SAID AL-GHOUL*** Signature:..... Date:.....
Ref. Dept.: ***MUHANAD AWARTANI*** Signature:..... Date:.....
Elec. Dept.: ***EHAB AL-DASOUQI*** Signature:..... Date:.....

Notes: ----------

Quality Engineer:..... Signature:..... Date: / /

Petra Engineering Industries Co.

PETRA

MECHANICAL & ELECTRICAL FACTORY SETTING CHECK LIST

Dear Client,
This check list has been specifically designed to ensure that all the necessary settings for your product have been made according to Petra's standards.

Project name:	Project No.:	Serial No.:
Unit Model:	Controller Model:	Date:

MECHANICAL SETTINGS			Factory Setting Values			
			Stage 1	Stage 2	Stage 3	Stage 4
Low Pressure Switch Cut In (psig)/ TYPE	FIXED					
Low Pressure Switch Cut Out (psig)						
High Pressure Switch Cut In (psig)/ TYPE	FIXED					
High Pressure Switch Cut Out (psig)						
Low Ambient Kit For Condenser Fans Drive Cut In (psig) (Option)						
Low Ambient Kit For Condenser Fans Drive Cut Out (psig) (Option)						
High Ambient Kit For Capacity Control Valve At Compressors Cut In (psig)						
High Ambient Kit For Capacity Control Valve At Compressors Cut Out (psig)						
Anti Freeze Thermostat: Cut In (System Is On) (°C)						
Anti Freeze Thermostat: Cut In (System Is Off) (°C)						
Oil Failure Cut Out Setting (psig)/ Time (s)						
Discharge Tempreture Cut Out (°C) (Option)						
Fluid Differential Pressure Switch Cut Out (psig)						
Fluid Differential Pressure Switch Cut In (psig)						
Hot Gas By Pass (Open) (psig) (Option)						
Hot Gas By Pass (Close) (psig) (Option)						

ELECTRICAL SETTINGS						
Compressor Overload Setting (Option)	(FLA)					
Evaporator Fan Motor Overload Setting (Option) (Supply)	(FLA)					
Evaporator Fan Motor Overload Setting (Option) (Return)	(FLA)					
Condenser Fan Motor Overload Setting (Option)	(FLA)					

Phase Failure relay Setting Valve :			
Anti Freeze Temperature Set Point :			
Fluid In Set Point :			
Fluid Out Set Point :			
Times Between Compressors (On-Off) :			
Frequency Invertor/Speed Regulator Settings :			
Max Amb Temp		Min Amb Temp	
Max Speed		Min Speed	

I, the undersigned, certify that this product has been successfully tested according to the specified requirements.

Notes: ----------

PTG Engineer : - ***SAID AL-GHOUL*** QA Engineer :-

Unit Check before Start

- Ensure that all piping has been completed.
- Check for refrigerant piping leak.
- Open liquid line valve for each system.
- Ensure water pumps are on. Check and adjust water pump flow and pressure drop across the cooler
- Verify flow switch operation.
- Check the control panel and compressor electrical box to assure it's free of foreign material.
- Be certain all water temperature sensors are inserted completely in their respective wells and are coated with heat conductive compound.
- Ensure that thermal expansion valve bulb are strapped and well insulated from other than suction temperature effect onto the suction line.

Check before Operation for the Electrical Side

These check need to be performed sequentially:

- The main cable for the power supply of the unit is as the manufacturer recommendation (refer to the electrical table page 9 for the selection of the main power supply cable).
- Proper disconnect main power switch is installed beside the unit for emergency or for maintenance purposes.
- The chiller is supplied through main power circuit breaker or fused disconnect switch (refer to the attached electrical table for the proper selection of the circuit breaker size).
- All field connection wrings were connected properly to the control terminal such as:-
  - Water flow switch signal
  - Pump inter lock signal
  - General alarm signal
  - Remote switch signal
- Refer to page (electrical field wiring) for more information Also it is important to refer to the wiring diagram for the exact field wiring connection. (field connection is represented by dash dot lines on the wiring diagram)
- Make sure that no obstacles exists that may stop the condenser fan(s), please test by moving the fan(s) by hand, also check direction of rotation.
- Inspect visually for any loose wires.

Sequence of Operation

Operation of the chiller is best understood by referring to the relevant power and control diagrams that are supplied with the unit.
The control panel layout (part of the wiring diagram) shows the location of each electrical component that is installed inside the electrical panel, such as (contactors circuit breakers, controllers, etc).
The power diagram shows the power connection for each motor. (D.O.L) Direct on Line starting method will be used as standard connection for all motors.

Before starting the chiller ▶▶▸▸▸

Make sure that:

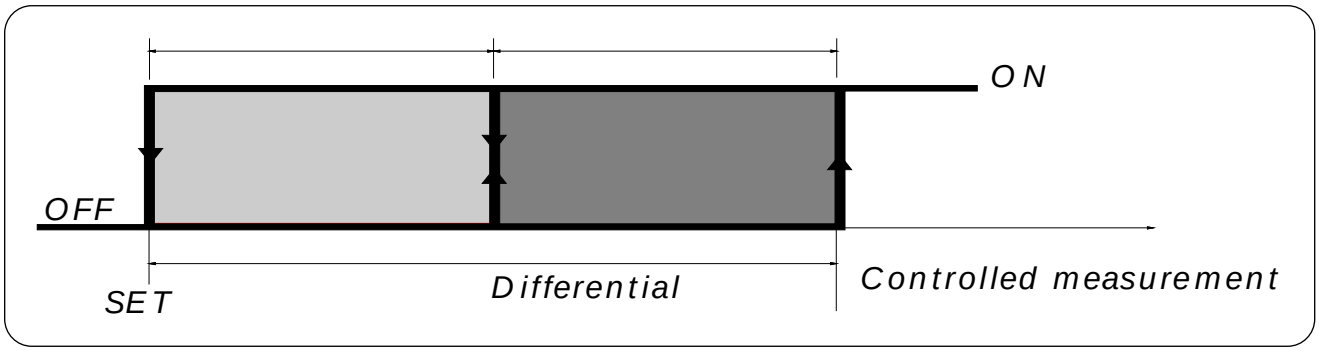
- The main incoming power supply is as per nameplate specification and the main power supply cables are well tightened and in the right sequence.
- Switch On the Main Power Circuit Breaker (MPCB) (supplied by others), this will energize the (PFR) Phase Failure Relay (Voltage Monitor), *if installed*, which will sense the main incoming power supply and will give Red Led signal if one of the following conditions was detected:
  - Lose in one of the phases at the main power terminal.
  - Phase reversal between two phases at the main power terminals.
  - Voltage drop in the main power supply that exceeds more 10% of the set value.
  - 3-Phase unbalance.
  - Over Voltage.
  - The (PFR) Green LED signal indicates correct power supply.
- Check the water flow rate (GPM), also check that system does not contain air bubbles and the system water pump is consuming normal current (amps).

Chiller Starting

- At the time the CCB is ON, this will energize:
  - The compressor crankcase heaters (if available)
  - The compressor motor protections (if available)
  - The control transformer that supplies the power for the controller

You must keep this situation for around 24 hours. If the chiller is going to be started for the first time or if the chiller has been idle for long period of time.

- The controller will start its self-diagnostic check, if all checks were satisfied and found correct.
- Enables unit operation from local keypad, digital input, or Building Automation System.
- The controller will start its normal operation by giving the START signal for the system water pump.
- Switch on the switch related to each compressor on the control diagram.
- The controller will read the water temperature and compare it to the set point.
- During the P.B (proportional band) the controller will calculate the number of stage that must start to meet the cooling or heating load demand.



Proportional Band Control for 2 Compressors

The controller will operate the compressors according to the lead-lag function that is the compressor with the minimum number of operating hours should start first. This is to ensure equal operating hours for each compressor.

Chiller Shut down

Controller will continue operating the unit until the water temperature is satisfied, the controller will switch off the lag compressor unloading the unit, if the load still decreasing the controller will switch off the next lag compressor.
When switching off a compressor the following action will be taken:
Shut off the liquid line solenoid valve LSV1.
The compressor crankcase heaters will energize keeping the small amount of refrigerant in the heat exchanger from migrating to the compressor.

Chiller alarms

If any abnormal condition occurred the controller will:
Take the correct action, stop the compressor or the complete unit. Give alarm signal on the display to inform the user with the error condition.
Energize the general alarm relay for remote indication of the error condition.

PETRA Mark II Controller

Refer to the error code displayed on the keypad and compare it to the error codes table (attached with the wiring diagram) you can find exactly the location of error that had stopped the unit.

Refer directly to text alarm message.
Some of the error signals are manually reset others are automatic reset.
For the manual reset alarms you might need to:
- Reset the alarm from the external device (such as high pressure) or/and
- From the reset button on the keypad of the controller.

For the automatic reset, no need for user intervention, the controller will take the proper action automatically.

Operation Limitation

Temperature

If the unit is to be used in an area with high solar radiation, unit should be mounted, so that the control box is not exposed to direct solar radiation (sun light). (Refer to the Temperature Table below)

* LWT: Leaving Water Temperature
[But upon a brine chiller application the minimum cooler LWT will be lower]

Temperature Table	°F
Maximum Ambient Temp	125
Minimum Cooler [LWT]*	38

Don't operate the chiller at water temperature below 38°F. Applications in that range require chillers with factory modification for brine duty. Contact your PETRA representative for more details.

Low Ambient Temperature (optional)

If the chiller is intended to be used at low ambient condition (< 45°F). Low ambient kit must be added to the chiller control panel. This is can be achieved through varying the speed of the condenser fan motor by using frequency inverter or voltage speed regulator. The speed of condenser fan motor can be regulated with reference to the ambient temperature to maintain constant condensing pressure in the condenser.

MAINTENANCE

Each RWC unit is designed and constructed for minimum maintenance and dependable operation. However, certain maintenance procedures are required to ensure maximum operating efficiency. Some suggested procedures with the recommended intervals are listed below

Be sure to disconnect power before attempting to check or service the unit, to prevent accidental start-up of the unit.

Special Maintenance

- After each severe windstorm, check the unit's exterior panels for secureness and damage.
- After each major electrical strom, check the unit for blown fuses or tripped overloads.
- Check the unit's insulation periodically to make sure that it is secure

Perform all maintenance procedures and inspections at the recommended intervals. This will prolong the life of the equipment and minimize the possibility of costly failures.

Weekly Maintenance

After the unit has been operating for approximately 30 minutes and the system has stabilized, check the operating conditions & complete the procedures below:-

- Check the evaporator refrigerant pressure & the condenser refrigerant pressure.
- Check the liquid line sight glasses. The refrigerant flow past the sight glasses should be clear. Bubbles in the refrigerant indicate either low refrigerant charge or excessive pressure drop in the liquid line.
- If operating pressure and sight glass conditions seem to indicate refrigerant shortage, measure the system superheat and system sub-cooling.
- If operating conditions indicate a refrigerant overcharge, remove refrigerant at the liquid line service valve. Allow refrigerant to escape slowly, to minimize oil loss. Do not discharge refrigerant into the atmosphere.
- Measure the power supply voltage, compressors and fans running amperes.
- Inspect the entire system for unusual conditions and inspect the condenser coils

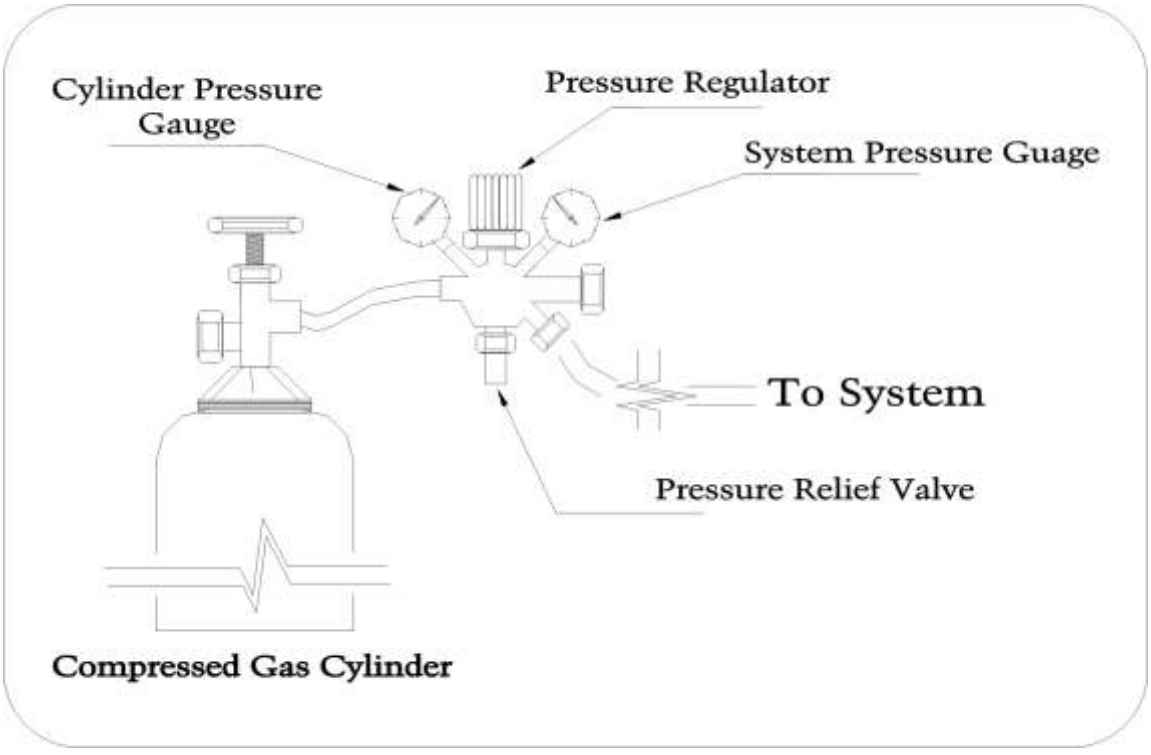
Annual Maintenance

for dirt & debris. If the coils are dirty clean. (Refer to coil cleaning procedure)

- Perform all weekly maintenance procedures.
- Have a qualified service technician to check the setting & function of each control. Inspect the condition of compressor & control contactors and replace as required.
- Inspect all piping components for leakage and damage.
- Clean & repaint any areas that show signs of corrosion.
- Inspect electrical wiring condition tighten any loose connections.
- Clean the condenser coils.
- Clean the condenser fans, check the fan assemblies for proper clearance in the fan openings and for motor shaft misalignment, abnormal and play, vibration & noise.
- Check the oil level (if available).

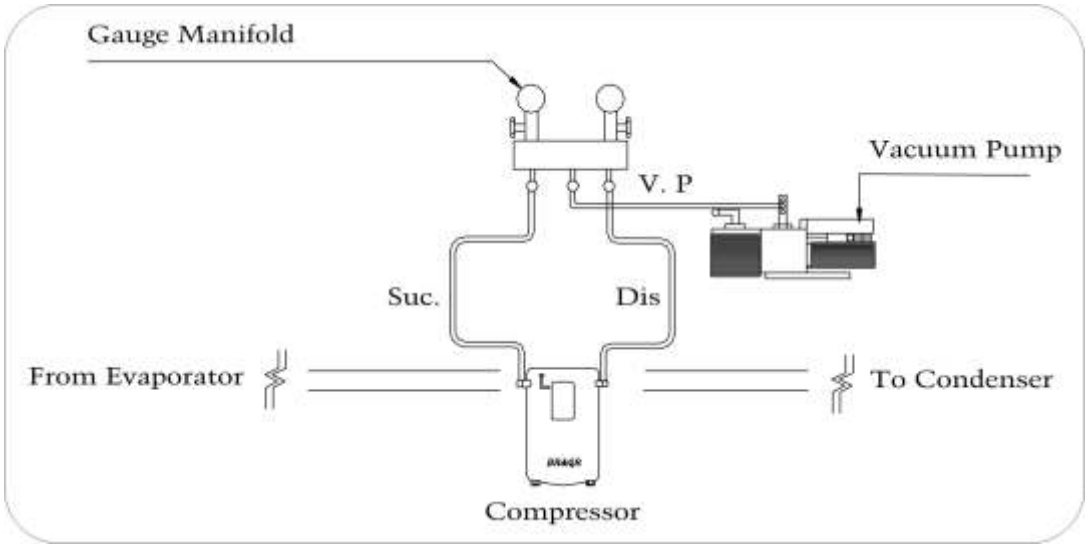
Leak Test System

All units should be under sufficient pressure to conduct a leak test after installation. If there is no system pressure, admit nitrogen into the system until some pressure is observed and then proceed to test for leaks. After leaks are repaired the system must be dehydrated.
Use dry nitrogen and refrigerant to raise the system pressure up to 150 Psig (1050Kpas). The procedure requires a separate relief valve with gauge set and a gas cylinder.
With the compressed gas cylinder in the upright position, admit the dry nitrogen slowly until the desired pressure is obtained. Carefully check the complete system for leaks by means of soap bubbles. Where bubbles appear, a leak exists.
Check at all points that are expected to leak, such as flare connections, flanges, quick coupling, brazing, joints..etc. Leave the system for a certain time and watch the gauge for any drop in reading. When the test is complete, system pressure should be reduced to 0 Psig (0Kpas) the compressor is evacuated and charged with the proper kind of refrigerant.



System Evacuation

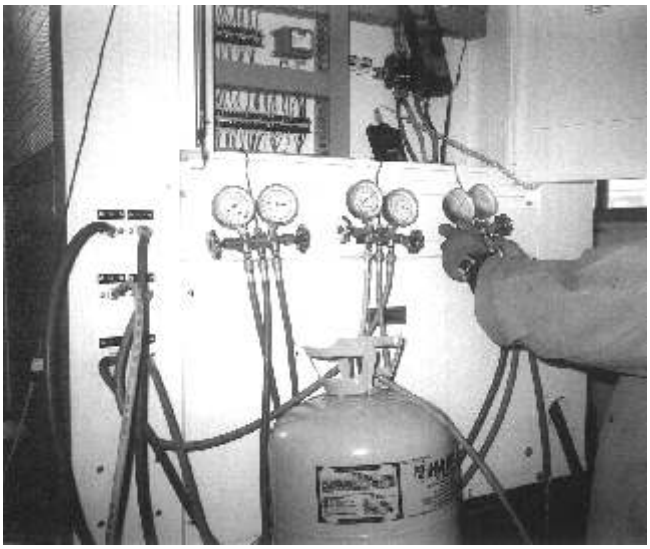
System evacuation is considered the most important process to prepare the unit for charging and to remove both air and moisture from the system, and it could be done as follows:



- Connect gauge manifold to the system.
- Purge all pressure from the system by opening the system services valve(s) and the gauge manifold hand valves.
- Connect the center hose on the gauge manifold to the vacuum pump.
- Connect gauge manifold to the system.
- Close off the gauge manifold hand valve.
- Stop the vacuum pump but not before closing the gauge manifold hand valves.
- Disconnect the center hose of the gauge from the vacuum pump and connect it to a cylinder containing the proper type of refrigerant.
- Open cylinder valves and loosen the center hose at gauge manifold. Purge the hose for a few seconds then tighten the connection.
- Close the refrigerant cylinder valves and admit refrigerant into the system until a pressure of about 5 Psig (35 Kpas) is indicated on the gauges.
- Disconnect the hose from the cylinder.
- Open the gauge manifold hand valves and purge the pressure from the system.
- Repeat steps 3 through 11.
- Repeat steps 3 through 9 only.
- Open the gauge manifold hand valves and admit refrigerant into the system cylinder pressure as indicated on the gauges.
- Close the high side gauge manifold hand valves.
- Start the unit and add the proper charge of refrigerant.

Refrigerant Charging

The unit is charged with the refrigerant for which it is designed. Efficient operation of an air-conditioning unit depends on the correct charge of refrigerant by weight. In case of an under charged unit, the evaporator is starved of refrigerant, which leads to low compressor suction pressure, loss in output and perhaps overheating of the compressor motor, in case of suction gas cooled compressors (high superheat). Overcharging the unit can lead to condenser overflow and thus too high condenser pressure, to evaporator flooding and possibly to compressor damage due to liquid coming into the compressor. Sudden pressure in the condenser indicates exceeding the pumping capacity of the unit and filling of the condenser with liquid, increased cooling of suction line as well as an increase in noise of the working valve in the compressor. Liquid knocking also indicates unit overcharge or incorrect adjustment and/or incorrect function of the control system. Gaseous refrigerant is only charged if small quantities are intended.
Refrigerant bottles with double or single valves stand upright and refrigerant is charged by means of the pressure gauge connection in the compressor suction shutoff valve. When doing so, check condenser pressures when charging liquid refrigerant and determine charging weight. If cylinder pressure drops too low for further charging before the job is finished, place cylinder in a bucket of warm (77° - 113° F) water, or use a heat lamp to increase pressure. Do not apply heat with a torch. Never heat cylinder above 122°F.



Refrigerant Charging

Never heat bottles with the flame of the lamp such as a Bunsen or welding burner.

The process used most often to determine the correct refrigerant quantity is by observing the refrigerant flow in the sight glass in the liquid line. Since an uninterrupted supply of liquid is necessary for the proper functioning of expansion valves, it may be assumed that the unit has been correctly filled when a clear flow of liquid refrigerant is visible. Bubbles or foam usually indicate insufficient refrigerant. However, care should be taken that no bubbles are seen in the sight glass, even though, the unit has been fully filled.

Additionally the temperature in the condenser could also lead to sudden evaporation, e.g. by switching the fan ON at the condenser. Thus, the sight glass is a valuable device in determining the correct filling quantity.
After all field connections (electrical and mechanical) have been completed and the system has been evacuated, the system can be fully charged with refrigerant in two ways as shown below.

The main job of a service engineer is to upkeep modern, mechanical cooling system running. *It is essential to know the proper way to handle refrigerant* to all types of systems. All systems do not use the same refrigerant. All systems do not use the same amount of charge even when capacities may be entirely comparable.

All manufacturers include a name-plate that clearly lists the refrigerants for which the system was designed. How much charge to use will vary widely from system to system. This makes it doubly important always to check the catalogues & service bulletins..

Do not charge blends in *vapor phase*. This means that the refrigerant should be removed from the cylinder as a liquid (either from the dip tube in a two valve cylinder or by inverting the cylinder). The liquid is allowed to evaporate (flush) in the charging lines. Small systems with a single component refrigerant such as 134a are usually charged through the gauge port of the compressor suction service valve.

Normal procedure is:

- Back-seat suction service valve as for normal operation.
- Loosely connect line from service manifold to suction service valve gauge port.
- Connect center line from manifold to the refrigerant cylinder.
- Back-seat discharge service valve.
- Loosely connect remaining line from service manifold to discharge service valve gauge port.
- Slightly open cylinder valve to purge vapor up to the compressor discharge service valve.
- Tighten discharge service valve connection at gauge port.
- Purge vapor from cylinder up to compressor suction service valve.
- Tighten suction service valve connection gauge port. Open both compressor service valve.
- Place cylinder of refrigerant on weighing scale.
- Pressurize system to full cylinder pressure and make final leak check.
- Start compressor. Run unit head pressure and suction pressure stabilize. Open the cylinder valve completely and control the flow of refrigerant from the manifold. From time to time, note suction pressure with the cylinder valve closed.From time to time, note discharge pressure to see that it does not rise above the level normally expected under operating conditions. For air-cooled system, the discharge pressure should be approximately the pressure corresponding to ambient temperature plus 52° F (refrigeration) to 63° F (air conditioning). When correct weight of refrigerant has been introduced, close cylinder valve and disconnect charging line.
- When satisfied that the system is operating as it should, back-seat both suction and discharge service valve. Bleed pressure from both gauge lines through the manifold charging port.
- Replace cylinder valve cap and fit flare plugs in open ends of charging and gauge lines. Replace plugs in gauge ports of compressor service valve.

If possible, refrigerant should always be charged by weight, using a good scale.

If cylinder pressure drops too low for further charging before the job is finished, place cylinder in a bucket of warm (77-115°F) water, or use a heat lamp to increase pressure. Do not apply heat with a torch. Never heat cylinder above 122°F.

Charging the refrigerant in the *liquid phase* has always been customary for larger systems. It is essential for charging blend refrigerants such as 407 c. If a complete charge is to be added to an evacuated system the liquid is frequently charged through the compressor discharge service valve. The compressor is not operated while charging. The procedure for attaching the manifold and purging the lines is similar to that described for vapor charging. On most systems, a charging port is located on the liquid line downstream from the receiver.

In this case, refrigerant can be added while the system is not operating. General suggestions will not always apply to specific operations but the following outline may be helpful.

Connect the refrigerant cylinder to the charging port. Use as short a line as possible to minimize water contamination or use a drier if indicated by conditions. The cylinder should be upside down if it does not have a liquid/ vapor valve. Install a pressure gauge so that the compressor discharge pressure can be observed.

With the connection to the charging port loose, *crack cylinder valve and purge charging line* with refrigerant using the VAPOR hand wheel of a cylinder fitted with a liquid/ vapor valve. Tighten connection, open cylinder valve and check for leaks.

Close the valve at the receiver outlet or if there is no receiver close the valve in the liquid line upstream from the charging port. This is necessary to prevent the condensing pressure from forcing liquid into the cylinder.

With the compressor running , *slowly open the charging port valve and charge liquid* using the LIQUID hand wheel at a rate fast enough to keep the compressor from cutting out on low-pressure control if possible. The refrigerant flow can also be controlled by the cylinder valve to avoid ending up with a hose full of liquid refrigerant, The same result can be obtained by closing the cylinder valve first when charging is finished.

Watch the discharge pressure. A rapid rise in pressure indicates, that the condenser is filling with liquid. If this is the case, the system pump-down capacity still seems low on charge, an auxiliary receiver may be needed.

Never charge the liquid in the low pressure side of the system.

Don't overcharge. Overcharging results in higher pressure, possible compressor damage and higher power consumption.

During charging or removal of refrigerant, be sure water/fluid is continually circuiting through the cooler to prevent freezing. Damage caused by freezing is considered abuse and may void PETRA warranty.

System Pump Down

This procedure is used to isolate the refrigerant in the condenser coil. This process can be utilized for maintenance, repairs and long periods of shutdown.

Pump down procedure:

- Install pressure gauge in the unit, if not installed.
- Install a jumper across the terminals of the low pressure cutout.
- Operate the unit.
- Start closing the shut off valve while the unit is operating.
- When low pressure gauge reaches about 5 Psig shut down the unit.
- Immediately close the compressor suction valve.
- Repeat the above once again.
- Remove the jumper from the low pressure cutout.

Charging Filter Drier

The main function of the filter dryer is to eliminate any humidity or deposits inside the system. When the filter is blocked, a certain pressure drop across the filter occurs and a temperature difference between the liquid in/out and the filter can be sensed. In this case the filter has to be changed.

The process is as follows:

- System pump down procedure has to be carried out.
- Loosen the flare connection or solder of filter drier.
- Take out the old filter.
- Install the new filter drier.
- Evacuate the low pressure side (do not forget to open solenoid valve).
- Open all valves, and the unit is ready to start.

Compressor Oil

All units are factory charged with oil. The approved oils to be added upon need are:
Mobil RL 32CF

Do not re-use drain oil and do not use any oil that has been exposed to the atmosphere.

Coil Cleaning

Clean the condenser coils at least ONCE each year, or more frequently if the unit is located in a "dirty" environment. This will maintain proper unit operating efficiencies. To clean the coils, use a soft brush and a vacuum cleaner.

Cleaning the Evaporator

The chilled water system is a closed-loop and therefore should not accumulate scale or sludge. If the chiller becomes fouled, first attempt to dislodge the material by back-flushing the system.

Water Flow Limits

Evaporator flow rates below the tabulated values will results in laminar flow causing freeze-up problems, scaling and poor control. Evaporator water flow rates exceeding those listed may result in excessive tube erosion.

The use of improperly treated or untreated water in this equipment may result in scaling, erosion, corrosion, algae or slime.

Final Check

Before leaving the unit, check all controls and protective devices function properly .

TROUBLE SHOOTING

Use the tables in this section to assist and help you in identifying the cause or causes of any malfunctions in the unit's operation. The column headed RECOMMENDED ACTION will suggest repair procedures.

Disconnect electrical power inspection before servicing the unit and allow all rotating equipment to stop completely. Failure to do so may result in personal injury or death from electrical shock or any moving parts.

No.	Source of Trouble	Possible Causes	Corrective Steps
1	Compressors fails to start	a. Main switch open b. Thermal lockout relay opened c. Defective contactor d. System shut down by safety devices e. Thermostat set too high f. Liquid line solenoid will not open g. Motor electrical trouble h. Loose wiring	a. Close switch b. See point 9. c. Repair or replace d. Determine type and cause of shutdown and correct it before resetting safety switch e. Check evaporator temperature Lower thermostat setting, if possible without freeze-up f. Repair or replace g. Check motor for opens, short circuits or burn-out h. Check all wire junctions. Tighten all terminal screws
2	Compressor noisy or vibrating	a. Improper isolation b. Improper piping support c. Flooding of refrigerant into crankcase d. Motor rotor is loose (SRC)	a. Check isolator operation b. Relocate, add, or remove hangers. c. Check rating and setting of expansion valve d. Check key fit and tightness of rotor locking bolt
3	High discharge pressure	a. Discharge shut-off valve partially closed b. High ambient temperature c. System overcharged with refrigerant d. Excessive loading e. Non condensable in system	a. Open valve b. Provide cooler air to condenser c. Remove excess d. Reduce load e. Purge the non condensable
4	Low discharge pressure	a. Suction shut-off valve partially closed b. Insufficient refrigerant in system c. Low suction pressure	a. Open valve b. Check for leaks. Repair and add charge c. See point 6.
5	High suction pressure	a. Excessive load b. Expansion valve over feeding	a. Reduce load or add equipment b. Check remote bulb. Regulate superheat, Check valve rating against the application
6	Low suction pressure	a. Lack of refrigerant b. Evaporator dirty or iced up. c. Clogged liquid line filter drier d. Expansion valve malfunctioning.	a. Check for leaks. Repair and add charge b. Clean or defrost c. Replace cartridge(s) d. Check and reset for proper superheat Repair or replace if necessary.

No.	Source of Trouble	Possible Causes	Corrective Steps
7	Compressor loses oil	a. Shortage of refrigerant	a. Repair leak and recharge system with refrigerant and oil
		b. Low suction pressure	b. See entry "low suction pressure"
		c. Expansion valve stuck open	c. Repair or replace expansion valve
		d. Restriction in refrigeration system	d. Locate restriction and remove
8	Internal thermal protection lockout opened	a. High condensing temperature	a. See corrective steps for high discharge pressure
		b. Low voltage during high load	b. Check supply voltage and for excessive line drop
		c. Loose power wiring	c. Check all connections and tighten
		d. Defective relay	d. Replace
		e. Defective or grounded wiring in motor or power circuits	e. Repair or rewire
		f. Power line fault causing single phase running or unbalanced voltage.	f. Check supply voltage.
9	Compressor "short cycles"	a. Thermostat differential set too close	a. Check evaporator temperature Reset differential ensuring that there is no freeze up
		b. Overcharge of refrigerant	b. Remove excess
		c. Lack of refrigerant	c. Check for leaks. Repair and add charge
10	Motor overload relays open	a. Defective relay assembly	a. Repair or replace
		b. Low voltage during high load	b. Check supply voltage and for excessive line drop
		c. Defective or grounded wiring in motor	c. Repair or rewire
		d. Loose power wiring	d. Check all connections and tighten

SOUND POWER DATA dBA [50 Hz]

Model	Sound Power [dBA]								
	Band Frequency [Hz]								
	63	125	250	500	1k	2k	4k	8k	Total
RWC 25	49	51	50	60	66	63	58	48	69
RWC 30	49	51	50	60	66	64	58	48	69
RWC 40	58	60	67	70	74	71	65	56	78
RWC 47	58	60	67	70	74	71	66	56	78
RWC 55	58	60	67	70	74	72	66	57	78
RWC 76	61	63	70	74	76	75	69	61	81
RWC 105	61	63	70	74	76	75	69	60	81
RWC 128	63	65	72	77	78	78	73	63	83
RWC 160	63	65	72	76	78	78	71	66	83
RWC 210	64	66	73	77	79	78	72	63	84
RWC 260	36	48	65	77	78	81	79	68	85
RWC 310	37	48	65	75	77	81	78	70	85
RWC 350	36	47	64	76	77	81	79	68	85
RWC 390	37	48	65	78	78	82	80	69	86
RWC 430	36	47	64	76	77	81	78	68	85
RWC 470	38	48	65	76	77	81	78	71	85
RWC 530	37	48	65	79	78	83	80	70	86
RWC 580	38	49	65	78	78	82	79	71	86
RWC 630	39	50	67	78	79	83	80	72	87

- Sound Data as per ISO BS 3744 standard. (For Standard Units)
- Noise Data Accuracy œ 2 dBA

SOUND POWER DATA dBA [60 Hz]

Model	Sound Power [dBA]								
	Band Frequency [Hz]								
	63	125	250	500	1k	2k	4k	8k	Total
RWC 25	50	55	56	62	67	64	59	48	70
RWC 30	50	55	56	62	67	65	59	49	70
RWC 40	61	64	71	72	75	72	66	58	79
RWC 47	61	64	71	72	75	72	67	58	79
RWC 55	61	64	71	72	76	73	66	59	80
RWC 76	64	67	74	75	78	76	70	62	83
RWC 105	64	67	74	76	78	76	70	62	83
RWC 128	66	69	76	78	80	79	73	65	85
RWC 160	66	69	76	77	80	78	72	66	85
RWC 210	67	70	77	79	81	79	73	65	86
RWC 260	37	52	70	81	84	85	81	73	89
RWC 310	38	52	70	81	84	85	80	74	89
RWC 350	37	52	70	81	84	85	81	73	89
RWC 390	38	52	70	82	84	85	81	74	90
RWC 430	37	52	70	81	84	85	80	73	89
RWC 470	39	52	70	81	84	85	80	74	89
RWC 530	39	52	70	82	84	85	81	74	90
RWC 580	39	53	70	82	84	85	81	74	90
RWC 630	40	54	72	83	86	87	82	76	91

- Sound Data as per ISO BS 3744 standard. (For Standard Units)
- Noise Data Accuracy œ 2 dBA

GENERAL DATA [50 Hz]

Model	RWC	25	30	40	47	55	76	105	128	160
Power Supply	Volt/Phase/Hz	Volt **/1PH/50Hz		Volt **/3PH/50Hz						
Casing		Heavy Gauge Galvanized Steel								
Finishing		Oven Baked Electro Static Powder Coating								
Compressor		Hermatic Reciprocating					Hermetically Sealed Scroll			
No. of Compressors		1								
Grade Of Oil		Mobil RL 32CF								
Oil Charge	[Liter]	1.24	1.06	1.06	1.95	1.95	2.4	3.13	3.13	4.05
Cooler		Brazed Plate Heat Exchanger (BPHE)								
No. Of Coolers		1								
Refrigerant		R - 22								
Control		Expansion valve								
Refrigeration Circuits		1								
Condenser		Copper Tubes, Aluminum Fins								
Fins Per inch		12								
Rows		3		4	3	4	3	4		
Face Area	[Ft^2]	4.6	4.6	5.8	5.8	7.0	8.4	14.3	14.3	17.0
Condenser Fan		Propeller								
No. Of Fans		1					2		3	
Air Flow Rate	[CFM]	1994	1994	2673	2805	2811	5078	5622	7537	7916
Operation Weight (Approximately)	[Lb]	320	320	404	410	441	656	812	895	937

Model	RWC	210	260	310	350	390	430	470	530	580	630
Power Supply	Volt/Phase/Hz	Volt **/3PH/50Hz									
Casing		Heavy Gauge Galvanized Steel									
Finishing		Oven Baked Electro Static Powder Coating									
Compressor		Hermetically Sealed Scroll									
No. of Compressors		2			3		4	3	4		
Grade Of Oil		Mobil RL 32CF									
Oil Charge	[Liter]	3.13	3.13	4.05	3.13	3.13	3.13	4.05	3.13	3.13	4.05
Cooler		Shell & Tube									
No. Of Coolers		1									
Refrigerant		R - 22									
Control		Expansion Valve									
Refrigeration Circuits		2			3		4	3	4		
Condenser		Copper Tubes, Aluminum Fins									
Fins Per inch		12									
Rows		4									
Face Area	[Ft^2]	24.0	28.0	31.0	42.0	41.0	41.0	42.0	58.1	58.1	60.7
Condenser Fan		Propeller									
No. Of Fans		4	2								3
Air Flow Rate	[CFM]	11200	25271	26240	29038	29038	28931	29038	31370	31370	43106
Operation Weight (Approximately)	[Lb]	1532	1702	1824	2238	2238	2405	2445	3062	3062	3411

* Data Above Are Based On Water IN/OUT : 55/45 °F /°F
** For Power Supply Voltage Refer To Electrical Data Tables
*** For Copeland compressor only, for other compressors supply please refer to Petra Factory

GENERAL DATA [60 Hz]

Model	RWC	25	30	40	47	55	76	105	128	160
Power Supply	Volt/Phase/Hz	Volt **/1PH/60Hz		Volt **/3PH/60Hz						
Casing		Heavy Gauge Galvanized Steel								
Finishing		Oven Baked Electro Static Powder Coating								
Compressor		Hermatic Reciprocating					Hermetically Sealed Scroll			
No. of Compressors		1								
Grade Of Oil		Mobil RL 32CF								
Oil Charge	[Liter]	1.24	1.06	1.06	1.95	1.95	2.4	3.13	3.13	4.05
Cooler		Brazed Plate Heat Exchanger (BPHE)								
No. Of Coolers		1								
Refrigerant		R - 22								
Control		Expansion valve								
Refrigeration Circuits		1								
Condenser		Copper Tubes, Aluminum Fins								
Fins Per inch		12								
Rows		3		4	3	4	3	4		
Face Area	[Ft^2]	4.6	4.6	5.8	5.8	7.0	8.4	14.3	14.3	17.0
Condenser Fan		Propeller								
No. Of Fans		1					2		3	
Air Flow Rate	[CFM]	2436	2436	3241	3395	3402	6164	6805	9155	9603
Operation Weight (Approximately)	[Lb]	320	320	404	410	441	656	812	895	937

Model	RWC	210	260	310	350	390	430	470	530	580	630
Power Supply	Volt/Phase/Hz	Volt **/3PH/60Hz									
Casing		Heavy Gauge Galvanized Steel									
Finishing		Oven Baked Electro Static Powder Coating									
Compressor		Hermetically Sealed Scroll									
No. of Compressors		2			3		4	3	4		
Grade Of Oil		Mobil RL 32CF									
Oil Charge	[Liter]	3.13	3.13	4.05	3.13	3.13	3.13	4.05	3.13	3.13	4.05
Cooler		Shell & Tube									
No. Of Coolers		1									
Refrigerant		R - 22									
Control		Expansion Valve									
Refrigeration Circuits		2			3		4	3	4		
Condenser		Copper Tubes, Aluminum Fins									
Fins Per inch		12									
Rows		4									
Face Area	[Ft^2]	24.0	28.0	31.0	42.0	41.0	41.0	42.0	58.1	58.1	60.7
Condenser Fan		Propeller									
No. Of Fans		4	2								3
Air Flow Rate	[CFM]	13600	30758	31897	35040	35040	34916	35040	37906	37906	52113
Operation Weight (Approximately)	[Lb]	1532	1702	1824	2238	2238	2405	2445	3062	3062	3411

* Data Above Are Based On Water IN/OUT : 55/45 °F /°F
** For Power Supply Voltage Refer To Electrical Data Tables
*** For Copeland compressor only, for other compressors supply please refer to Petra Factory

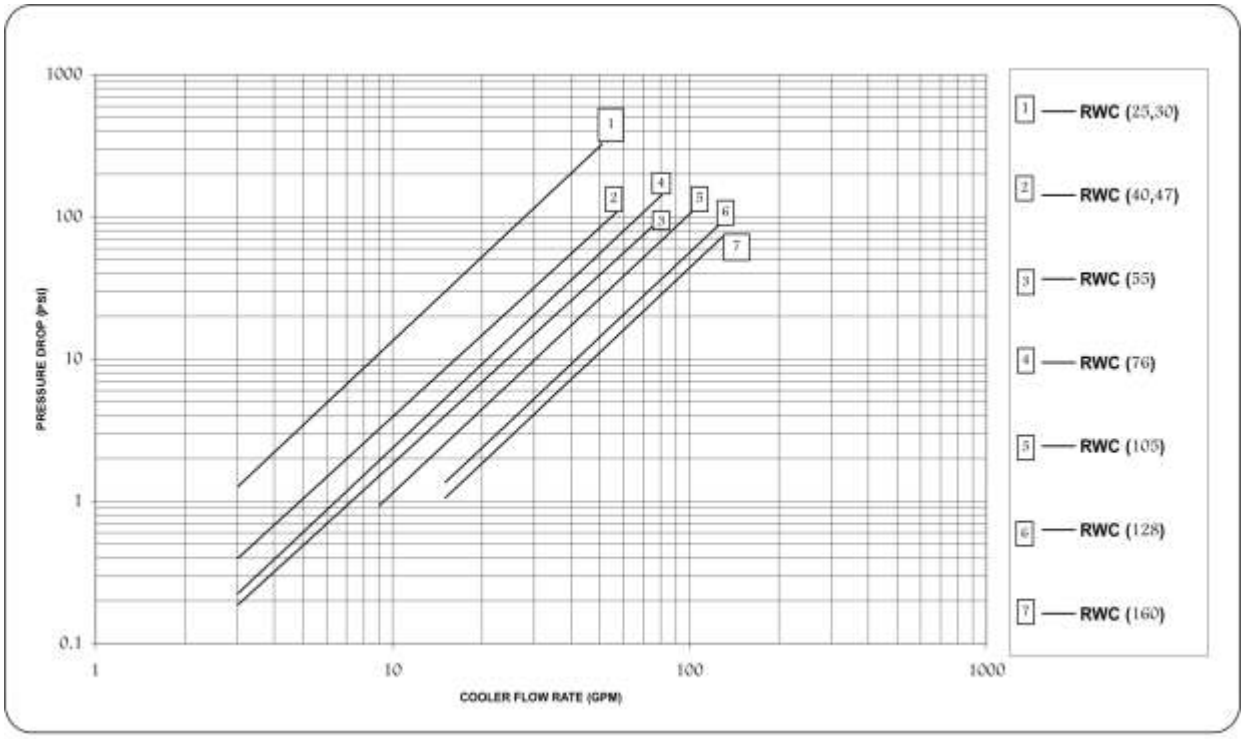
ELECTRICAL DATA TABLES

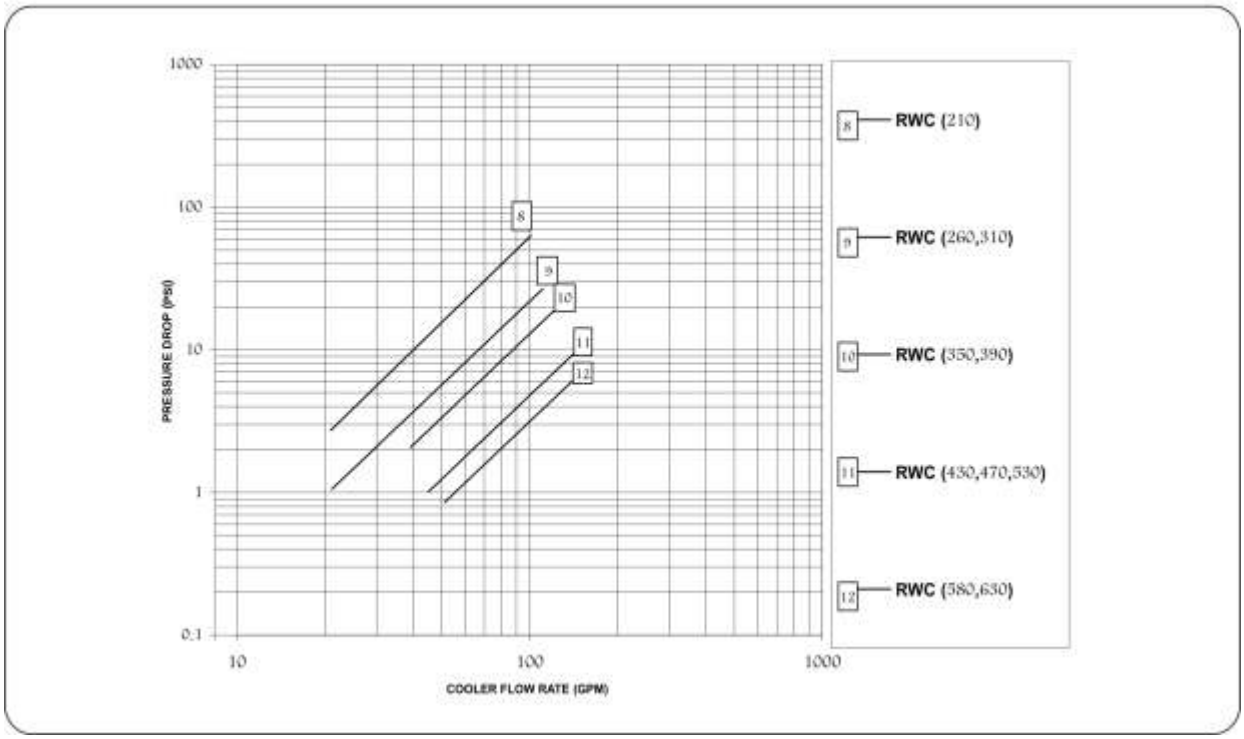
R22 + R407C/380-420V/50HZ											
RWC	COMP					CFM			MCA	MOP	MDS
MODEL	MODEL	FLA (AMP)	FLA (AMP)	QTY	QTY	MOTOR(KW)	FLA (AMP)	QTY	AMP	AMP	AMP
25-1PH	CR 30KQ/ 220V	16		1		GE-1/4 HP	1.4	1	22	35	25
30	CR 37KQ	6		1		GE-1/4 HP	1.4	1	9	15	16
40	CR 47KQ	7		1		EBM 0.2	0.48	1	10	15	16
47	CRPQ 450	9		1		EBM 0.2	0.48	1	12	20	16
55	CRNQ 500	9		1		EBM 0.2	0.48	1	12	20	16
76	ZR 94	14		1		EBM 0.2	0.48	2	19	30	25
105	ZR 125	17		1		EBM 0.2	0.48	2	23	40	25
128	ZR 144	20		1		EBM 0.2	0.48	3	27	45	25
160	ZR 19	26		1		EBM 0.2	0.48	3	34	60	32
210	ZR 125	17		2		EBM 0.2	0.48	4	40	60	45
260	ZR 144	20		2		SOMER 1.1	3	2	51	90	63
310	ZR 19	26		2		SOMER 1.1	3	2	65	90	125
350	ZR125+ZR 144	20	17	2	1	SOMER 1.1	3	2	68	90	125
390	ZR 144	20		3		SOMER 1.1	3	2	71	90	125
430	ZR 125	17		4		SOMER 1.1	3	2	79	90	125
470	ZR 19	26		3		SOMER 1.1	3	2	90	110	125
530	ZR 144	20		4		SOMER 1.1	3	2	91	110	125
580	ZR19+ZR 144	26	20	2	2	SOMER 1.1	3	2	105	125	200
630	ZR 19	26		4		SOMER 1.1	3	3	120	150	200

R22 + R407C/200-230V/60HZ											
RWC	COMP					CFM			MCA	MOP	MDS
MODEL	MODEL	FLA1 (AMP)	FLA2 (AMP)	QTY	QTY	MOTOR(KW)	FLA (AMP)	QTY	AMP	AMP	AMP
25	CR 30KQ	14		1		GE-1/4 HP	4.2	1	22	35	25
30	CR 37KQ	18		1		GE-1/4 HP	4.2	1	27	45	25
40	CR 47KQ	14		1		EBM 0.2	0.53	1	18	30	25
47	CRPQ 450	17		1		EBM 0.2	0.53	1	22	40	25
55	CRNQ 500	18		1		EBM 0.2	0.53	1	23	40	25
76	ZR 90	27		1		EBM 0.2	0.53	2	35	60	45
105	ZR 12	36		1		EBM 0.2	0.53	2	46	80	45
128	ZR 16	42		1		EBM 0.2	0.53	3	54	90	63
160	ZR 19	53		1		EBM 0.2	0.53	3	68	125	125
210	ZR 12	36		2		EBM 0.2	0.53	4	83	125	125
260	ZR 16	42		2		SOMER 2.2	9.5	2	114	150	125
310	ZR 19	53		2		SOMER 2.2	9.5	2	138	200	200
350	ZR16+ZR 12	42	36	2	1	SOMER 2.2	9.5	2	150	200	200
390	ZR 16	42		3		SOMER 2.2	9.5	2	156	200	200
430	ZR 12	36		4		SOMER 2.2	9.5	2	172	200	200
470	ZR 19	53		3		SOMER 2.2	9.5	2	191	250	200
530	ZR 16	42		4		SOMER 2.2	9.5	2	198	250	250
580	ZR19+ZR 16	53	42	2	2	SOMER 2.2	9.5	2	222	300	250
630	ZR 19	53		4		SOMER 2.2	9.5	3	254	300	315

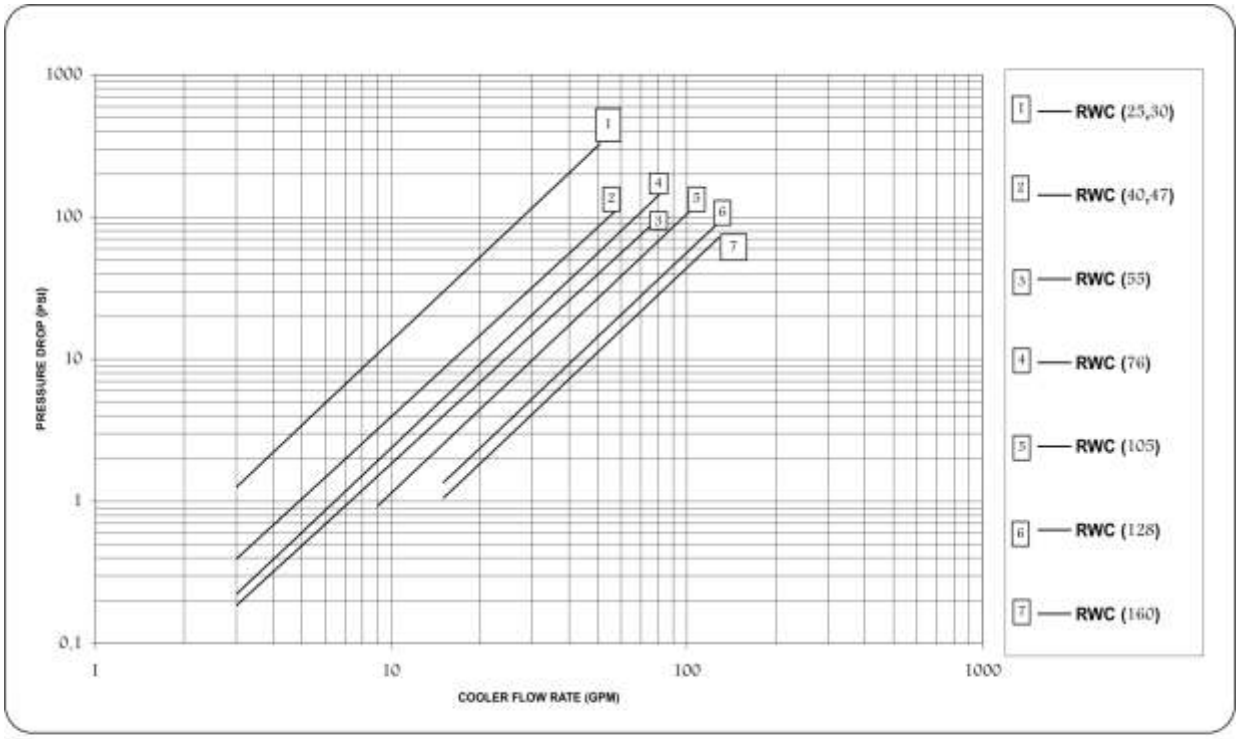
R22 - R407C-380-60HZ											
RWC	COMP					CFM			MCA	MOP	MDS
MODEL	MODEL	FLA1 (AMP)	FLA2 (AMP)	QTY	QTY	MOTOR(KW)	FLA (AMP)	QTY	AMP	AMP	AMP
25	CR 30KQ	12		1		GE-1/4 HP	1.7	1	17	30	16
30	CR 37KQ	6		1		GE-1/4 HP	1.7	1	10	15	16
40	CR 47KQ	7		1		EBM 0.2	0.53	1	10	15	16
47	CRPQ 450	9		1		EBM 0.2	0.53	1	12	20	16
55	CRNQ 500	9		1		EBM 0.2	0.53	1	12	20	16
76	ZR 90	16		1		EBM 0.2	0.53	2	21	35	25
105	ZR 12	22		1		EBM 0.2	0.53	2	30	50	32
128	ZR 16	25		1		EBM 0.2	0.53	3	33	60	32
160	ZR 19	32		1		EBM 0.2	0.53	3	42	70	45
210	ZR 12	18		2		EBM 0.2	0.53	4	43	60	45
260	ZR 16	25		2		SOMER 2.2	5.5	2	67	91	80
310	ZR 19	32		2		SOMER 2.2	5.5	2	83	110	125
350	ZR16+ZR 12	25	18	2	1	SOMER 2.2	5.5	2	85	110	125
390	ZR 16	25		3		SOMER 2.2	5.5	2	92	110	125
430	ZR 12	18		4		SOMER 2.2	5.5	2	88	110	125
470	ZR 19	32		3		SOMER 2.2	5.5	2	115	150	125
530	ZR 16	25		4		SOMER 2.2	5.5	2	117	150	200
580	ZR19+ZR 16	32	25	2	2	SOMER 2.2	5.5	2	133	175	200
630	ZR 19	32		4		SOMER 2.2	5.5	3	153	200	200

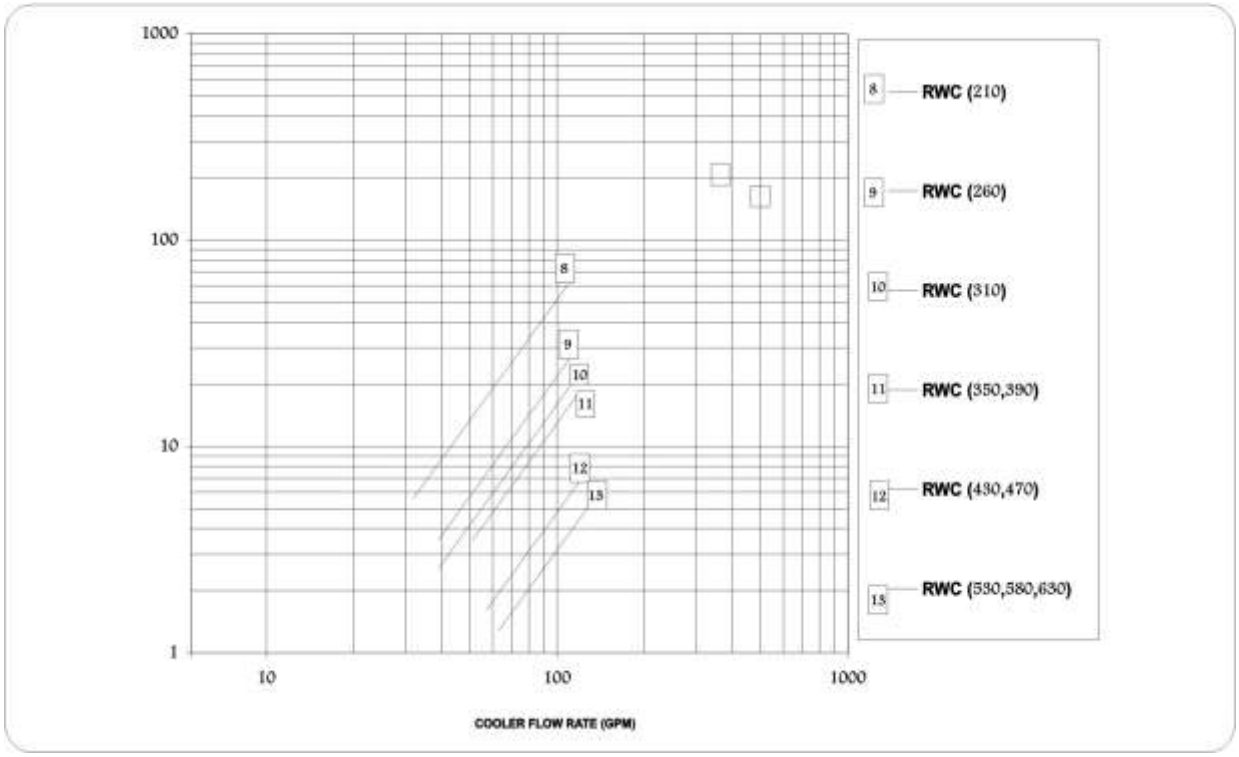
PRESSURE DROP CURVES [50 Hz]



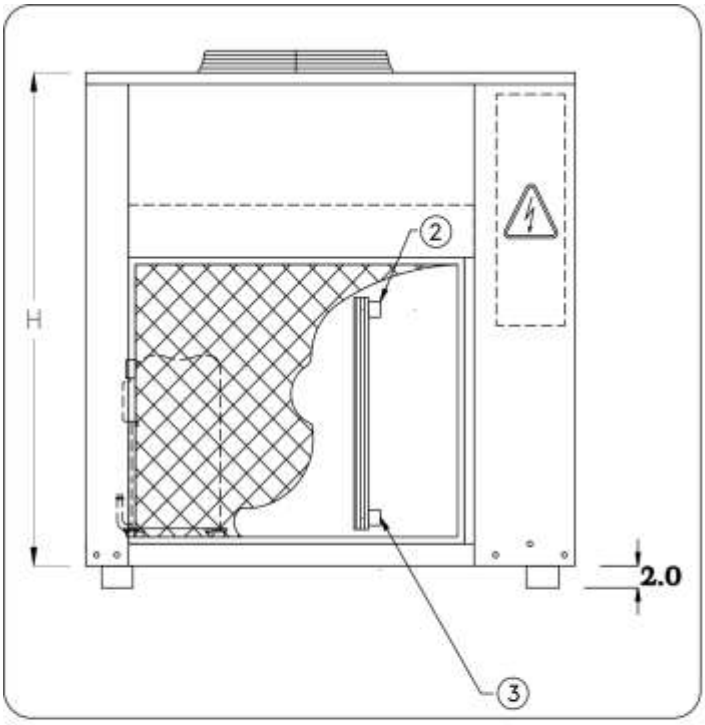


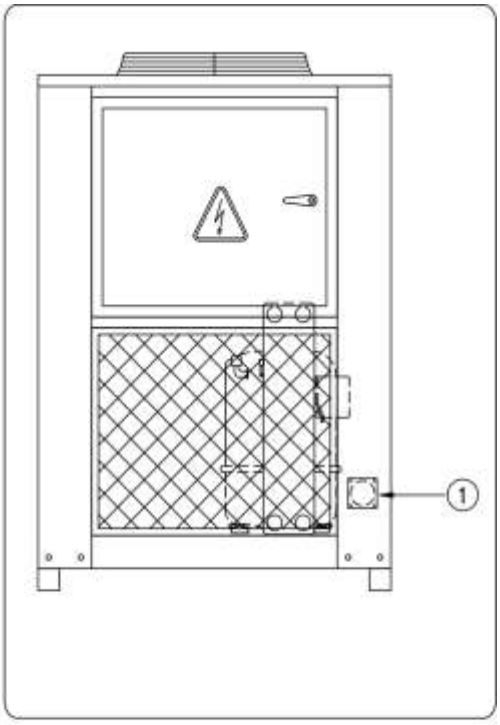
PRESSURE DROP CURVES [60 Hz]

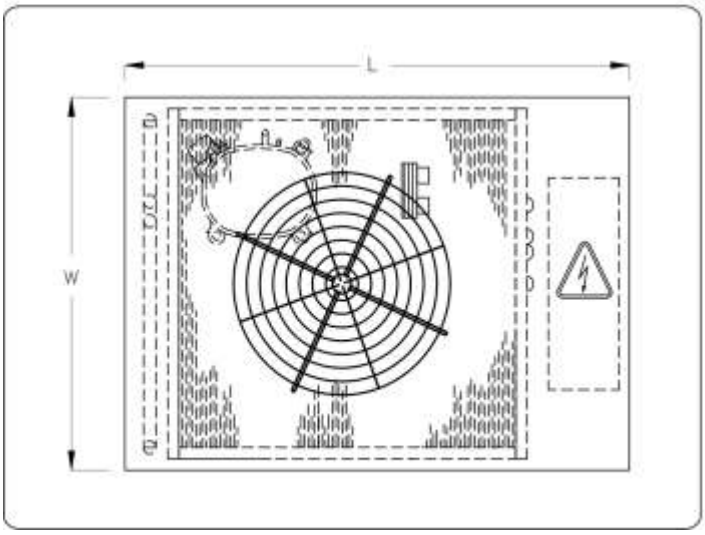




MODELS LAYOUT [50&60 Hz]





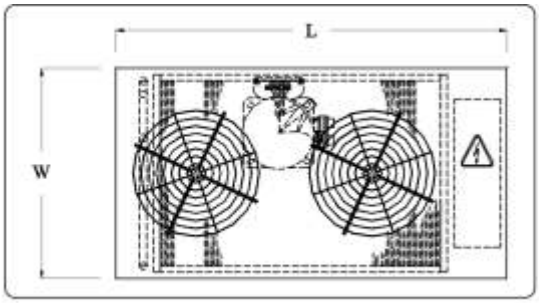


MODEL	L	W	H
RWC 25	45.18	26.4	45.5
RWC 30	45.18	26.4	45.5
RWC 40	45.18	32.3	44.1
RWC 47	45.18	32.3	44.1
RWC 55	51.00	32.3	44.1

All Dimensions are in Inch

① Electric inlet
② Water in
③ Water out

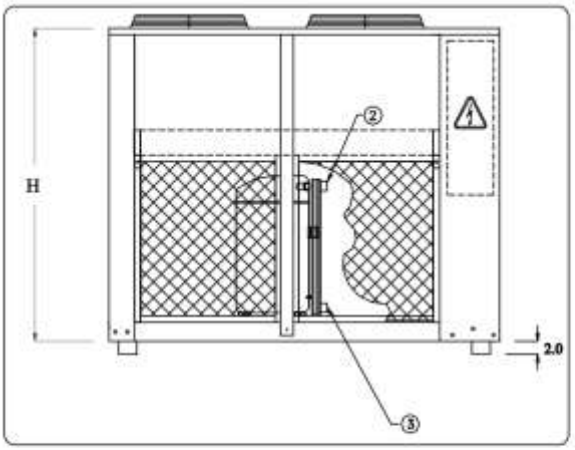
MODELS LAYOUT [50&60 Hz]

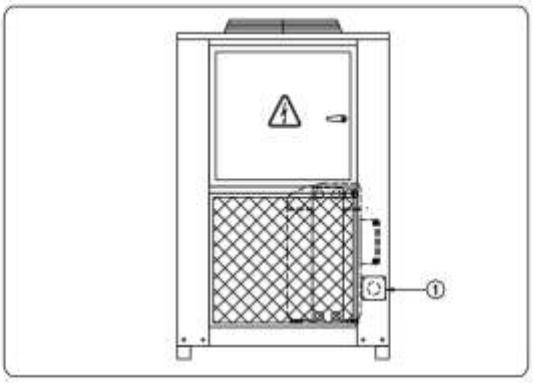


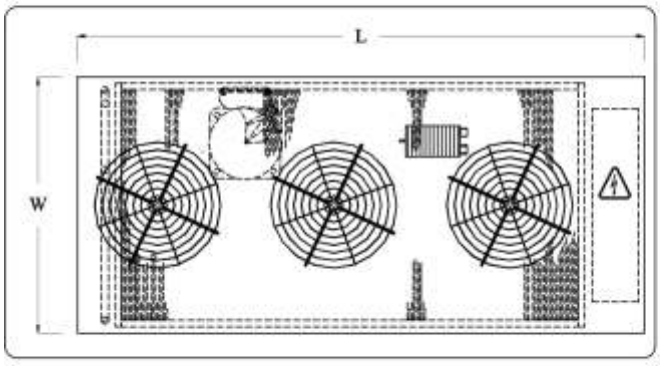
MODEL	L	W	H
RWC 76	60.0	32.3	48.0
RWC 105	69.1	42.3	48.0

All Dimensions are in Inch

① Electric inlet
② Water in
③ Water out



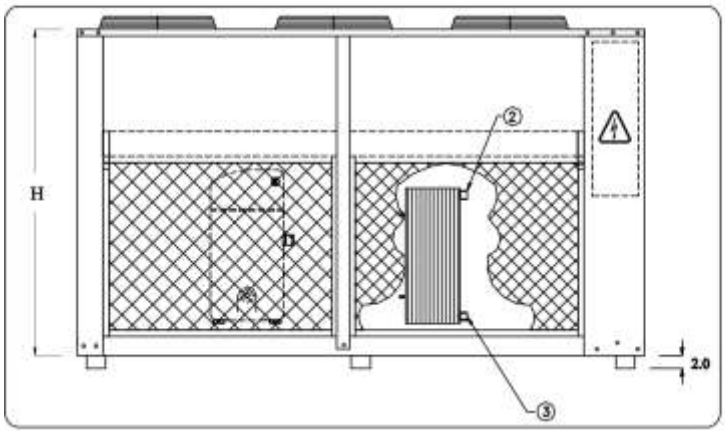


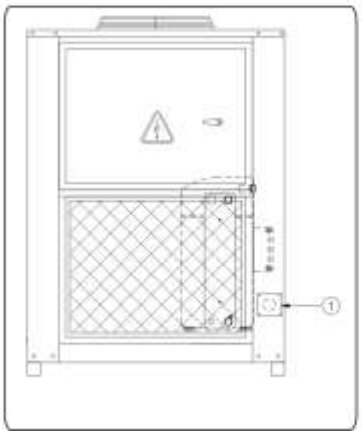


MODEL	L	W	H
RWC 128	87.0	33.5	50
RWC 160	87.0	39.4	53.2

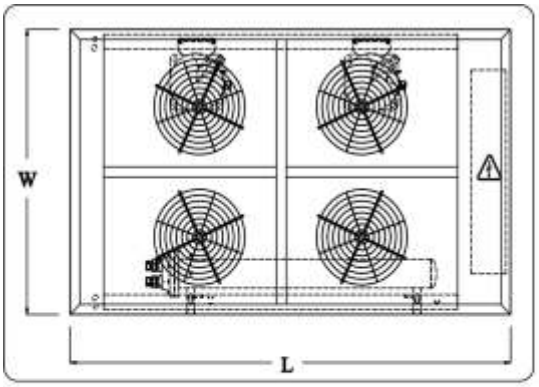
All Dimensions are in Inch

① Electric inlet
② Water in
③ Water out





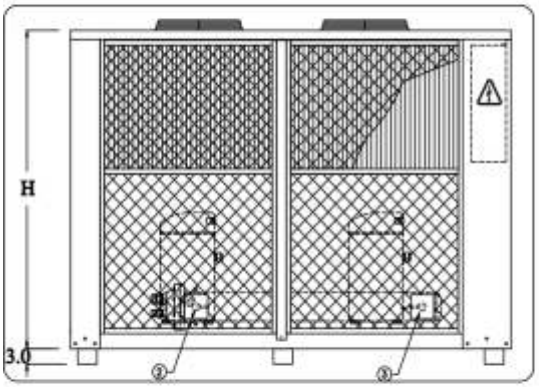
MODELS LAYOUT [50&60 Hz]

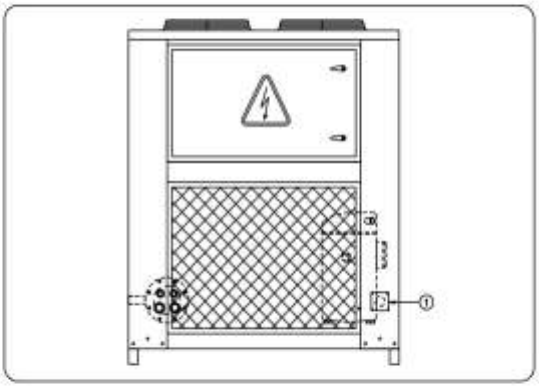


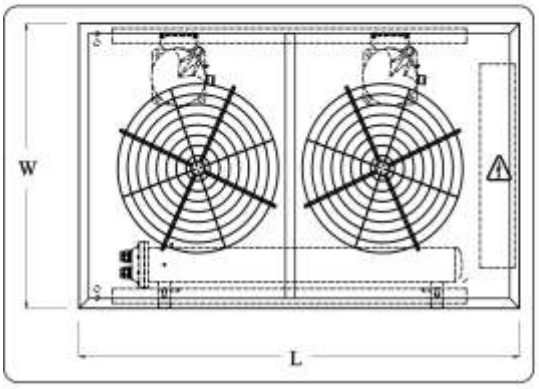
MODEL	L	W	H
RWC 210	89.8	55.1	63.6

All Dimensions are in Inch

① Electric inlet
② Water in
③ Water out



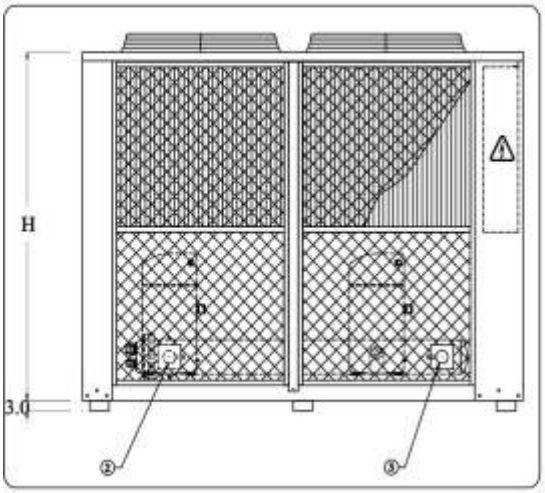


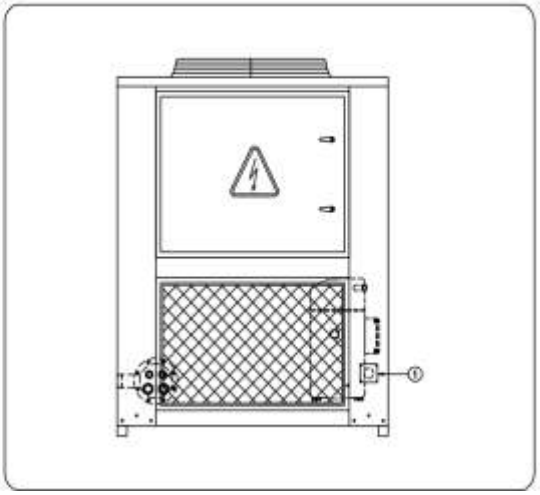


MODEL	L	W	H
RWC 260	89.8	55.1	67.5
RWC 310	89.8	55.1	70.5

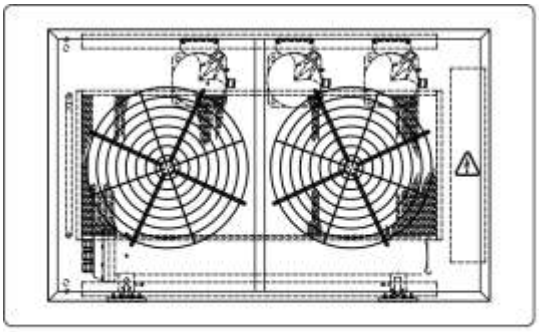
All Dimensions are in Inch

① Electric inlet
② Water in
③ Water out





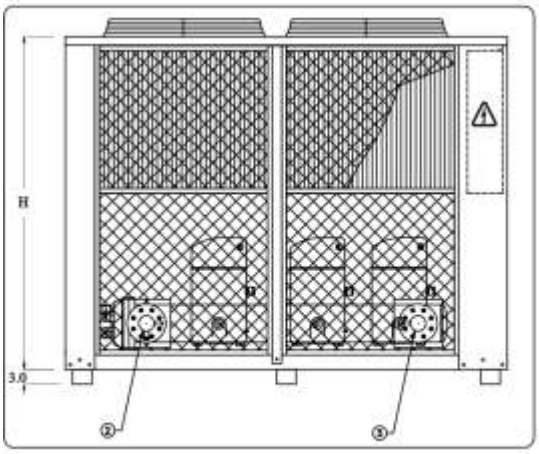
MODELS LAYOUT [50&60 Hz]

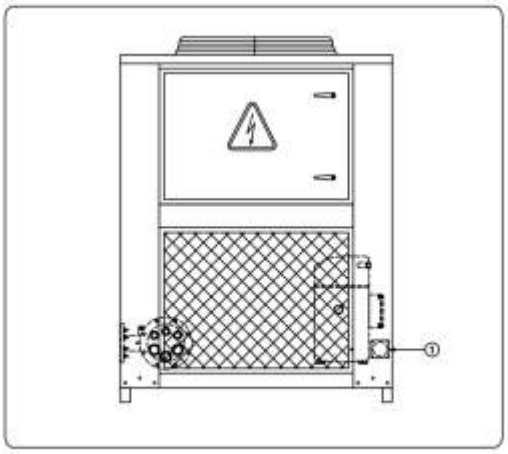


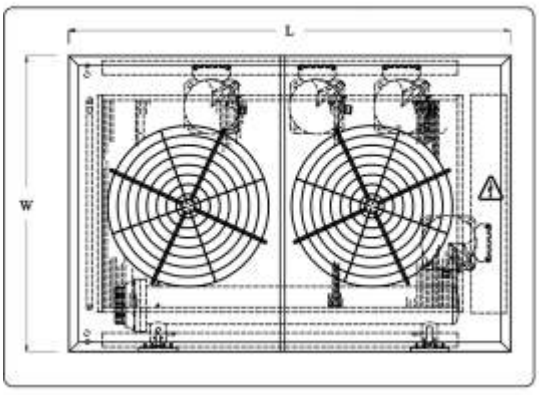
MODEL	L	W	H
RWC 350	89.8	55.1	67.5
RWC 390	89.8	55.1	67.5
RWC 470	89.8	55.1	67.5

All Dimensions are in Inch

① Electric inlet
② Water in
③ Water out



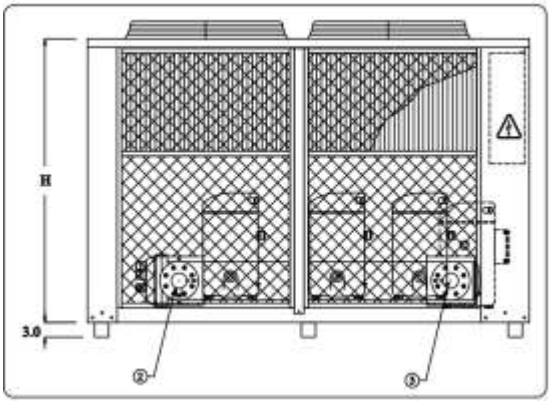


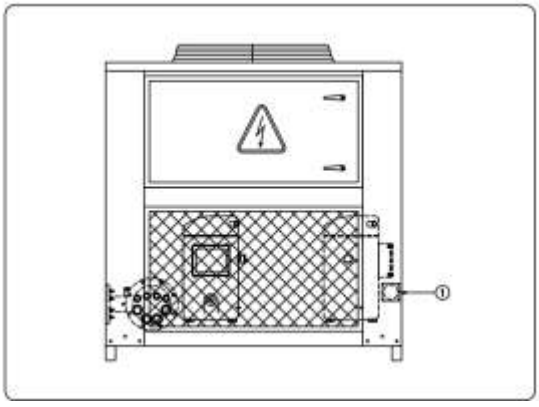


MODEL	L	W	H
RWC 430	89.8	60.0	59.8

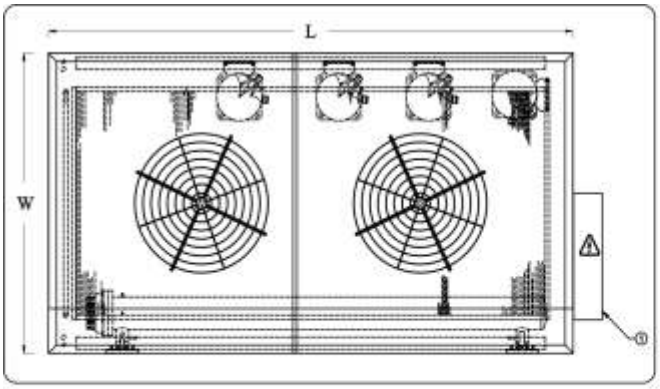
All Dimensions are in Inch

① Electric inlet
② Water in
③ Water out





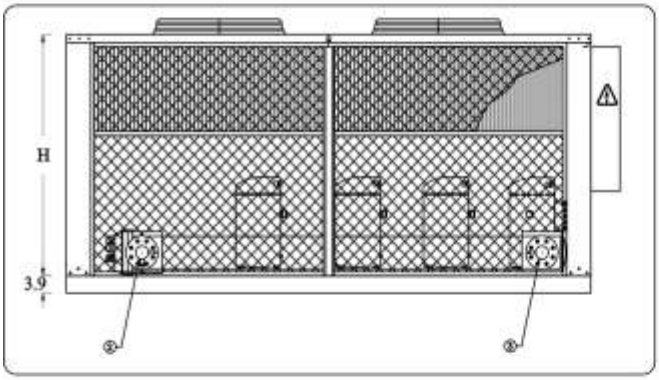
MODELS LAYOUT [50&60 Hz]

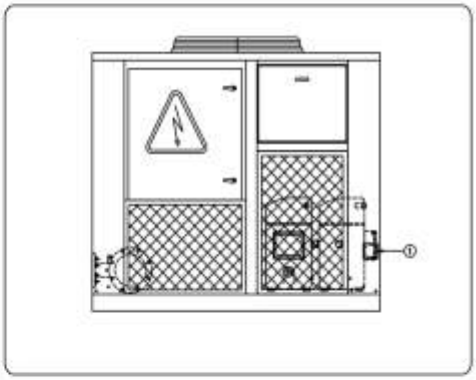


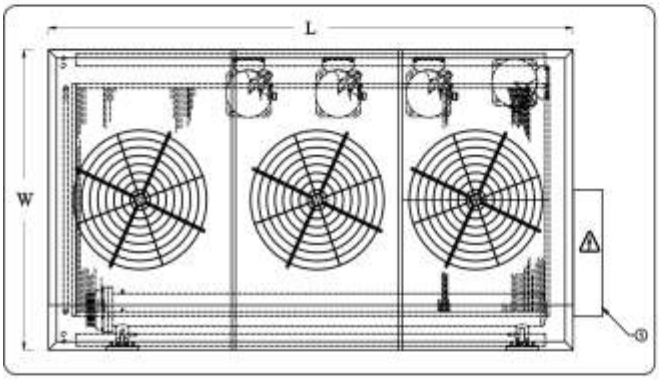
MODEL	L	W	H
RWC 530	114.6	67.9	59.1
RWC 580	114.6	67.9	59.1

All Dimensions are in Inch

① Electric inlet
② Water in
③ Water out



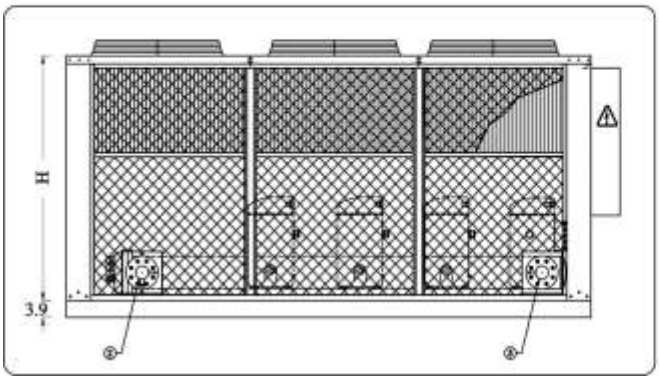


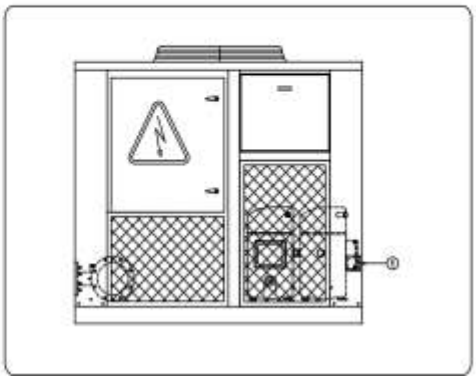


MODEL	L	W	H
RWC 630	114.6	67.9	60.0

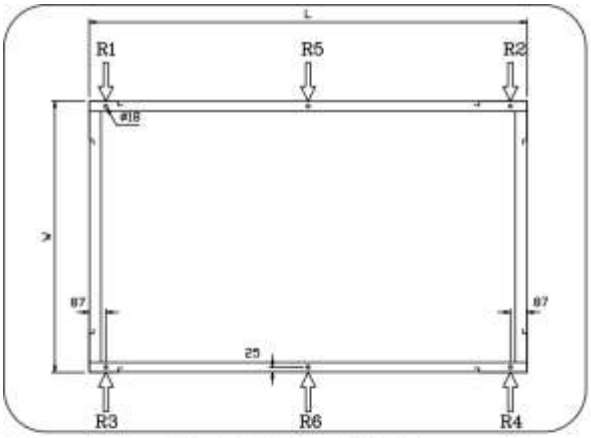
All Dimensions are in Inch

① Electric inlet
② Water in
③ Water out

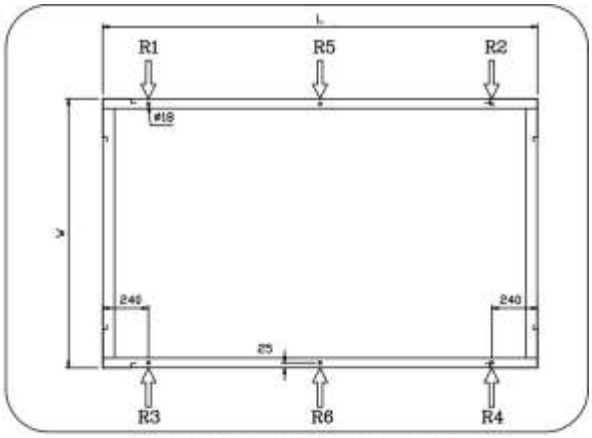




LOAD DISTRIBUTION



FOR RWC25~430N4



FOR RWC530N5+RWC630N4

1-STAGE

MODEL	R1(kg.)	R2(kg.)	R3(kg.)	R4(kg.)	R5(kg.)	R6(kg.)	UNIT WEIGHT
RWC25N4	100	103	75	77	–	–	355
RWC30N4	100	103	75	77	–	–	355
RWC40N4	86	132	82	106	–	–	406
RWC47N4	84	137	79	110	–	–	410
RWC55N4	92	149	88	122	–	–	451
RWC76N4	172	221	129	149	–	–	671
RWC105N4	211	333	211	242	–	–	997
RWC128N4	204	272	197	222	–	–	895
RWC160N4	225	286	206	220	–	–	937

2-STAGE

MODEL	R1(kg.)	R2(kg.)	R3(kg.)	R4(kg.)	R5(kg.)	R6(kg.)	UNIT WEIGHT
RWC210N4	265	250	210	210	358	260	1553
RWC260N4	285	267	234	234	382	300	1702
RWC310N4	306	287	247	247	417	320	1824

3-STAGE

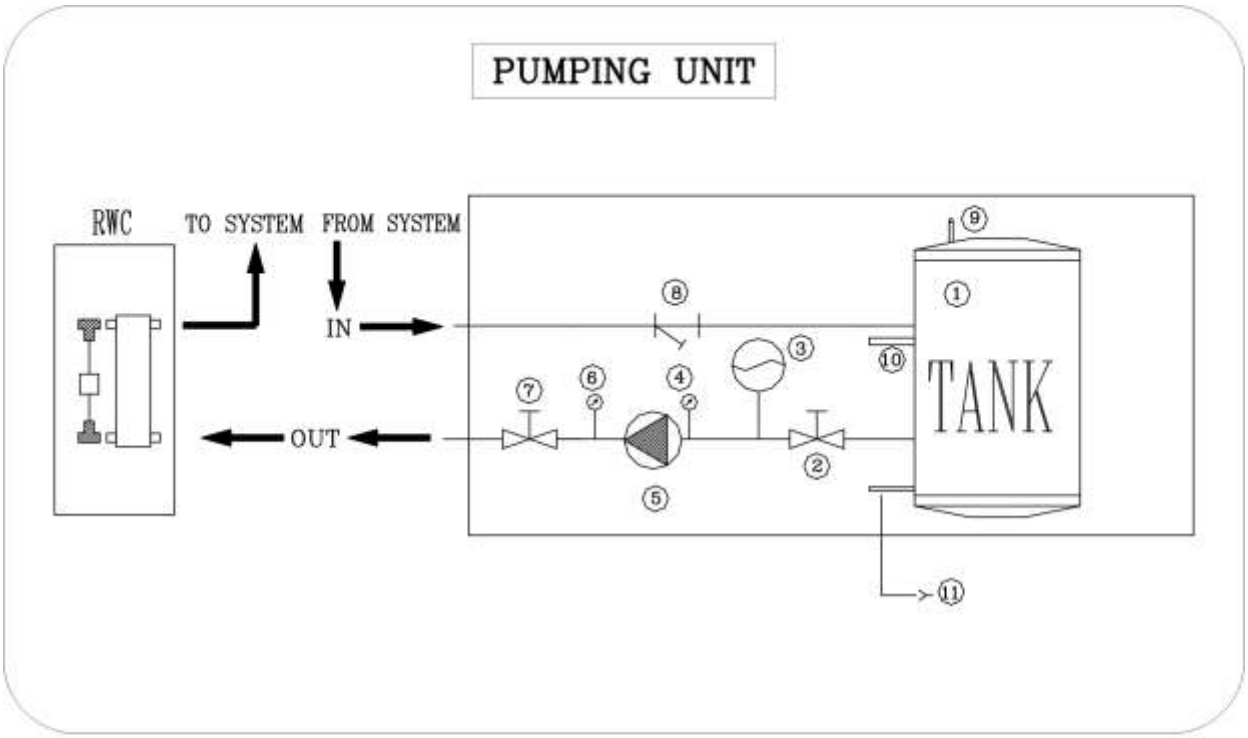
MODEL	R1(kg.)	R2(kg.)	R3(kg.)	R4(kg.)	R5(kg.)	R6(kg.)	UNIT WEIGHT
RWC350N4	333	372	290	310	518	415	2238
RWC390N4	333	372	290	310	518	415	2238
RWC470N4	337	387	332	357	534	498	2445

4-STAGE

MODEL	R1(kg.)	R2(kg.)	R3(kg.)	R4(kg.)	R5(kg.)	R6(kg.)	UNIT WEIGHT
RWC430N4	365	411	311	334	578	446	2445
RWC530N5	454	520	402	432	699	566	3063
RWC580N4	454	520	402	432	699	566	3063
RWC630N4	496	571	445	485	776	639	3412

All weights above are in LB

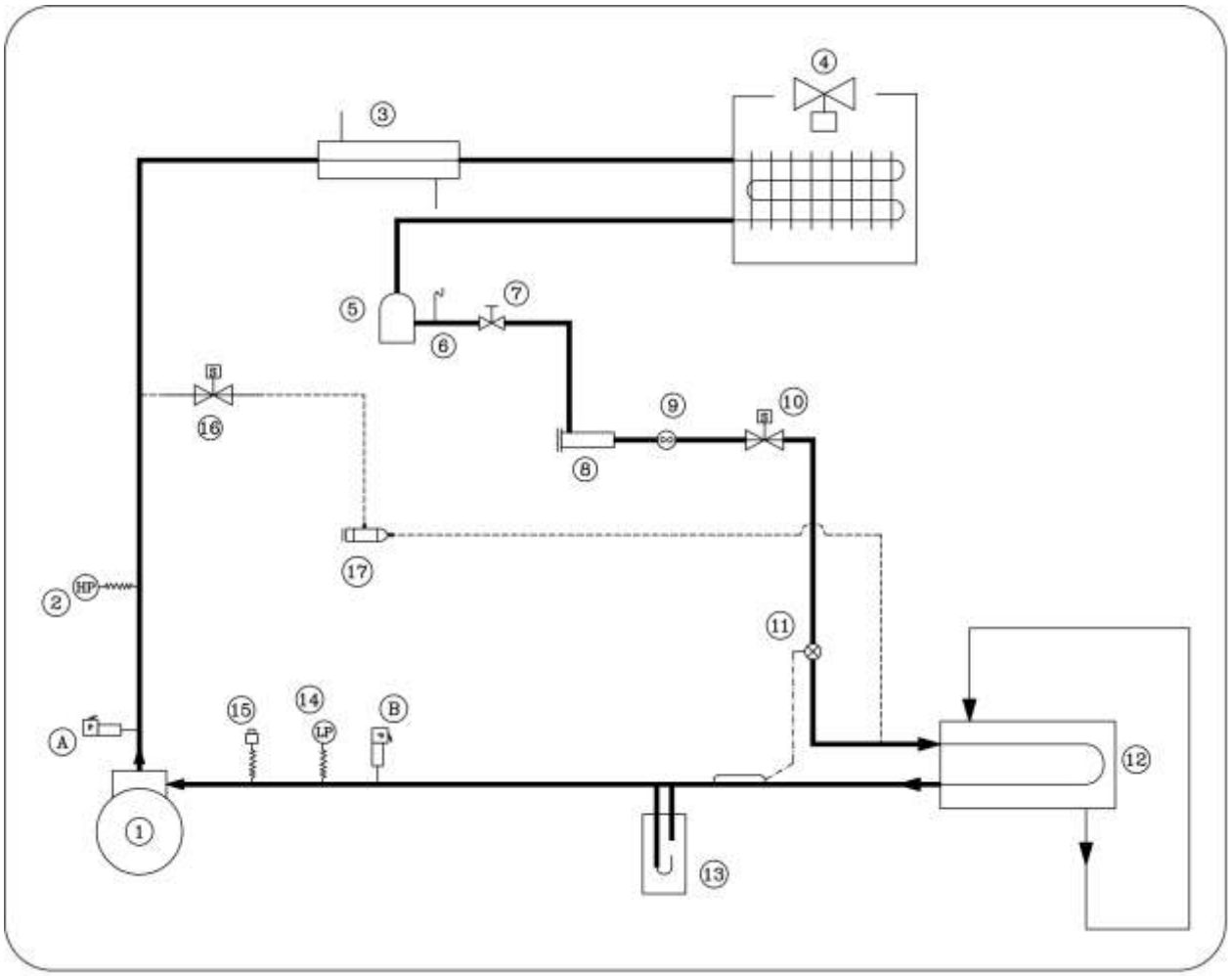
PPU REFRIGERATION SCHEMATIC DIAGRAM



#	ITEM	STATUS
11	Drain.	STD
10	Make up.	STD
9	Manual Air Vent.	STD
8	Strainer.	OPTION
7	Isolating Valve.	STD
6	Gauge.	OPTION
5	Water Pump.	STD
4	Gauge.	OPTION
3	Expansion Tank.	STD
2	Isolating Valve.	STD
1	Storage Tank.	STD

REFRIGERANT SCHEMATIC DIAGRAM

Cooling Only Units RWC [All Models] / RWCc [25-55]

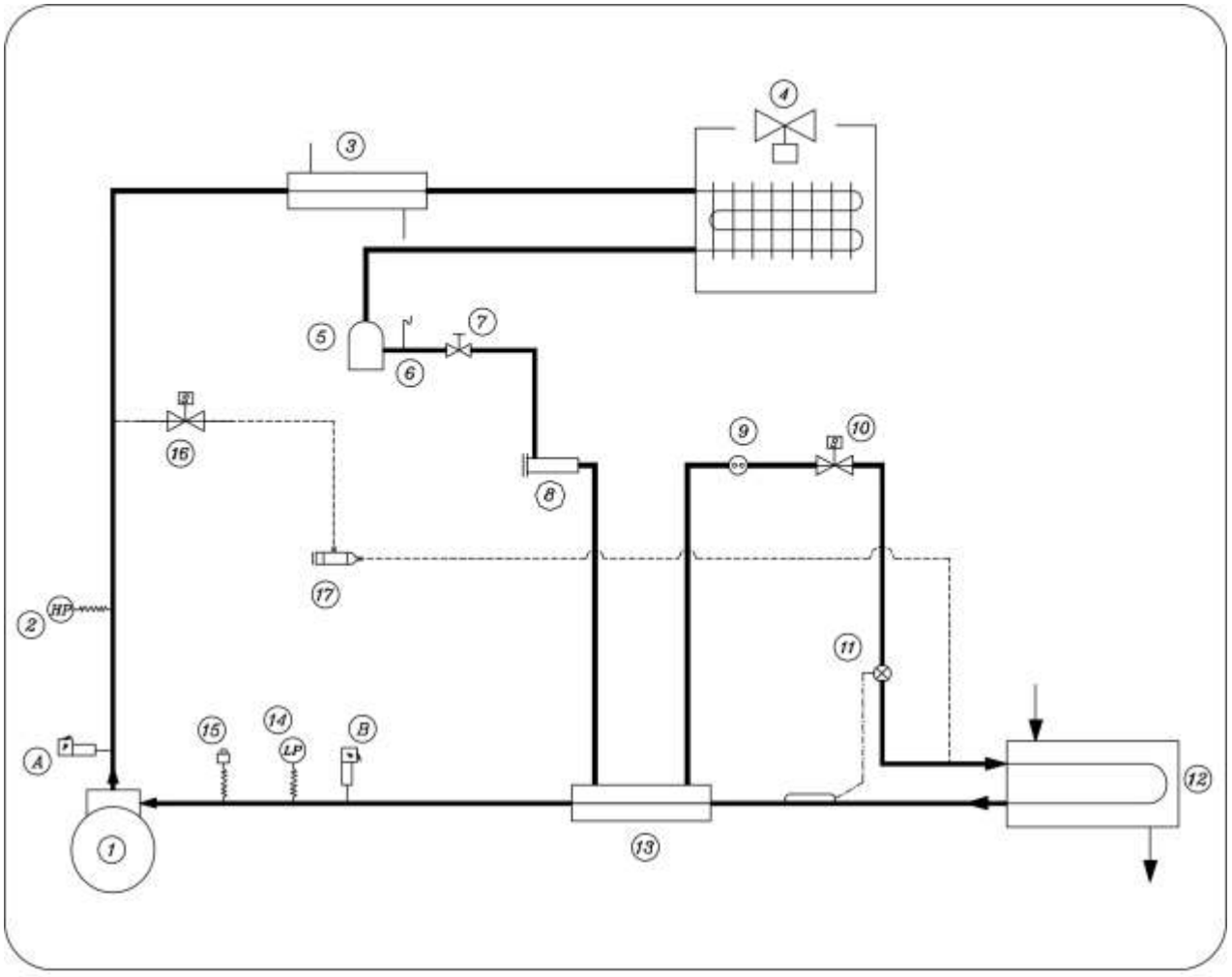


#	CONTROLLER	STATUS
A	Hi Pressure Switch.	STD
B	Low Pressure Switch.	STD

#	ITEM	STATUS
1	Hermatic Compressor.	STD
2	Hi Pressure Gauge.	OPTION
3	Heat Exchanger.	OPTION
4	Condenser Coil.	STD
5	Liquid Reciever.	OPTION
6	Fusible Plug.	OPTION
7	Shut Off Valve.	STD
8	Filter Drier.	STD
9	Sight Glass.	OPTION
10	Solenoid Valve.	STD
11	Expansion Valve.	STD
12	Cooler.	STD
13	Suction Accumalator.	OPTION
14	Low Pressure Gauge.	OPTION
15	Charging Nipple.	STD
16	Solenoid Valve.	OPTION
17	Hot Gas Controller.	OPTION

REFRIGERANT SCHEMATIC DIAGRAM

Cooling Only Units RWCc [76-630]

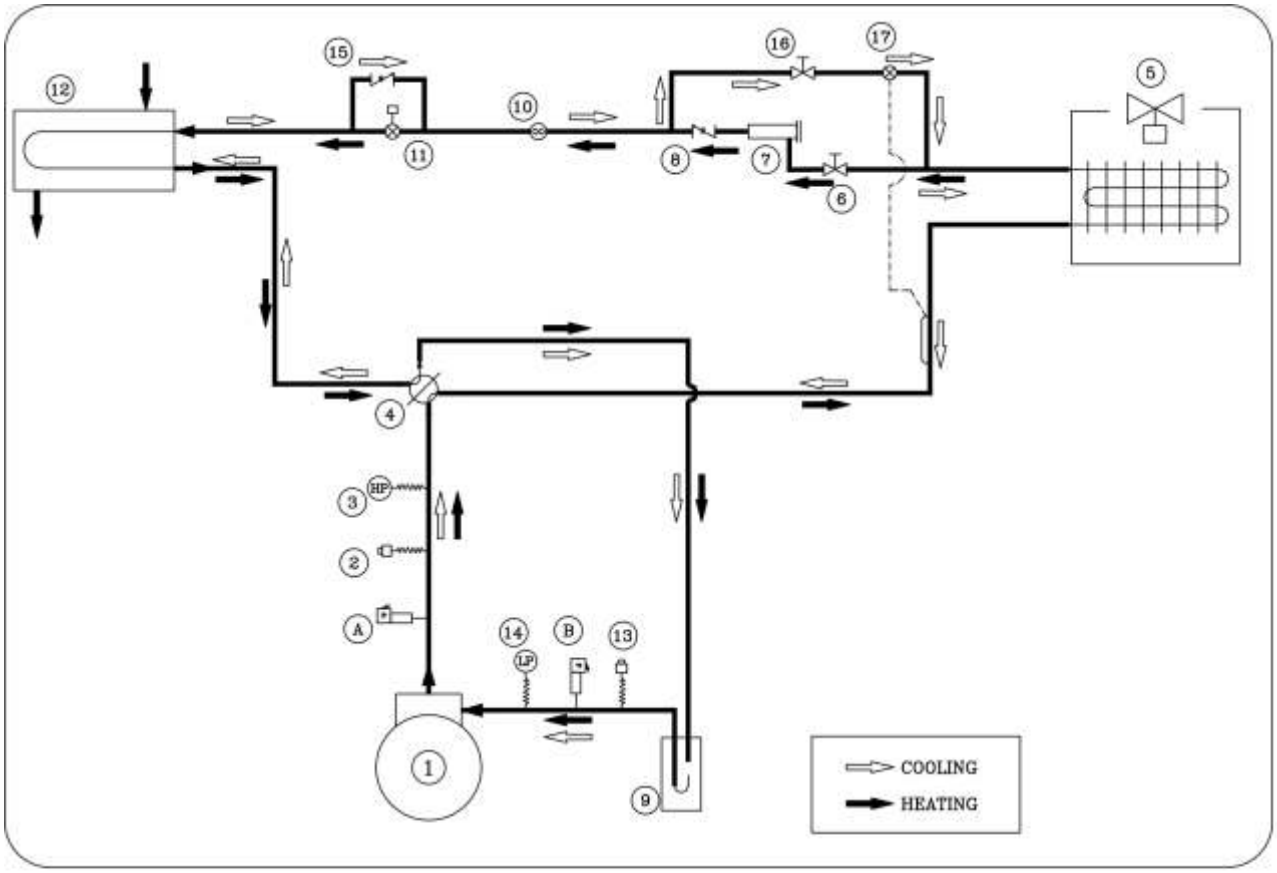


#	CONTROLLER	STATUS
A	Hi Pressure Switch.	STD
B	Low Pressure Switch.	STD

#	ITEM	STATUS
1	Hermatic Compressor.	STD
2	Hi Pressure Gauge.	OPTION
3	Heat Exchanger.	OPTION
4	Condenser Coil.	STD
5	Liquid Reciever.	OPTION
6	Fusible Plug.	OPTION
7	Shut Off Valve.	STD
8	Filter Drier.	STD
9	Sight Glass.	OPTION
10	Solenoid Valve.	STD
11	Expansion Valve.	STD
12	Cooler.	STD
13	Suction Accumulator Heat Exchanger.	STD
14	Low Pressure Gauge.	OPTION
15	Charging Nipple.	STD
16	Solenoid Valve.	OPTION
17	Hot Gas Controller	OPTION

REFRIGERANT SCHEMATIC DIAGRAM

Optional Heat Pump Units RWC [All Models] / RWCc [25-55]

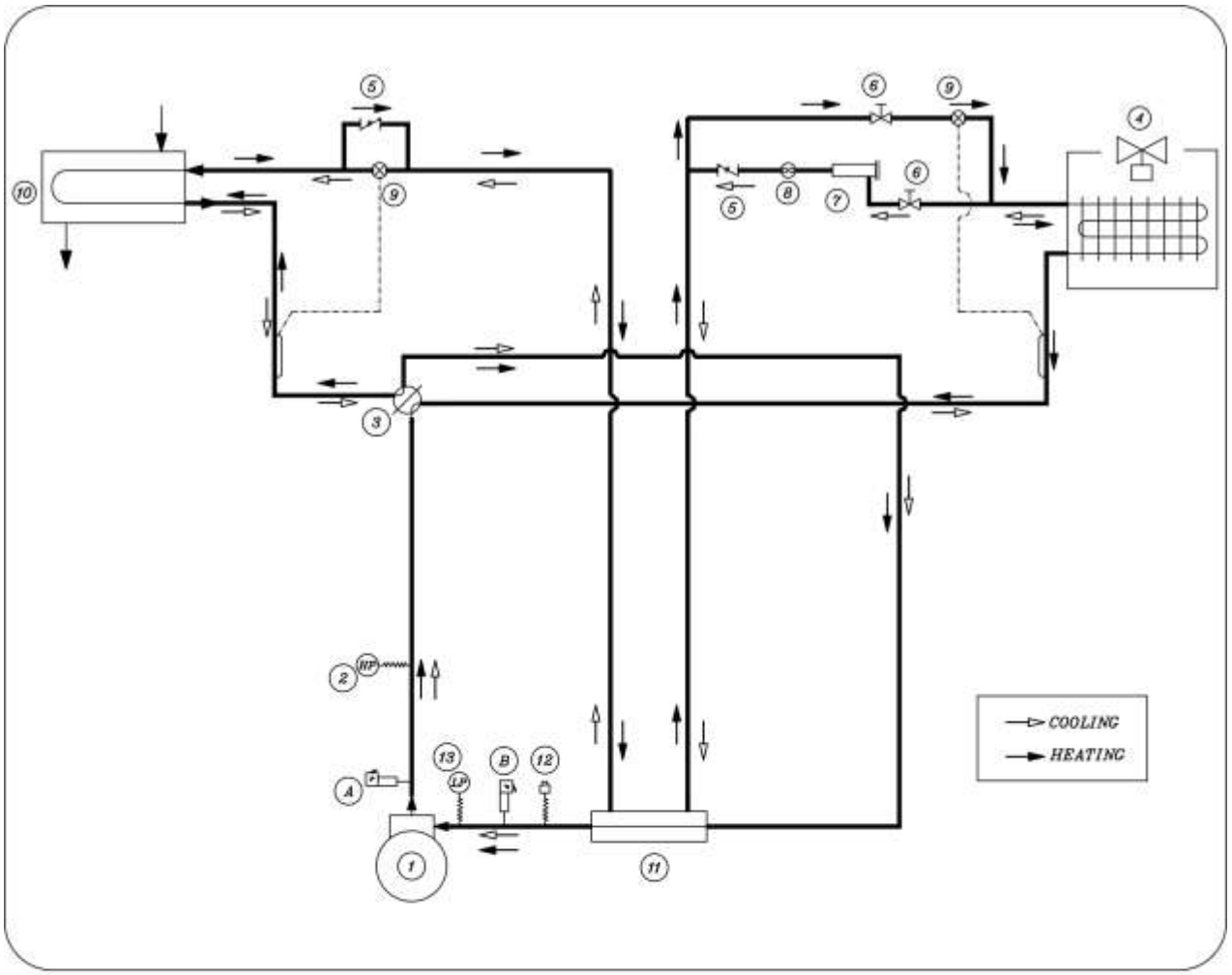


#	CONTROLLER	STATUS
B	Low Pressure Switch.	STD
A	Hi Pressure Switch.	STD

#	ITEM	STATUS
17	Expansion Valve.	STD
16	Shut Off Valve.	STD
15	Check Valve.	STD
14	Low Pressure Gauge.	OPTION
13	Charging Nipple.	STD
12	Cooler.	STD
11	Expansion Valve.	STD
10	Sight Glass.	OPTION
9	Suction Accumalator.	STD
8	Check Valve.	STD
7	Filter Drier.	STD
6	Shut Off Valve.	STD
5	Condenser Coil.	STD
4	Reversing Valve(4-Way Valve).	STD
3	Hi Pressure Gauge.	OPTION
2	Charging Nipple.	STD
1	Hermatic Compressor.	STD

REFRIGERANT SCHEMATIC DIAGRAM

Optional Heat Pump Units RWCc [76-630]

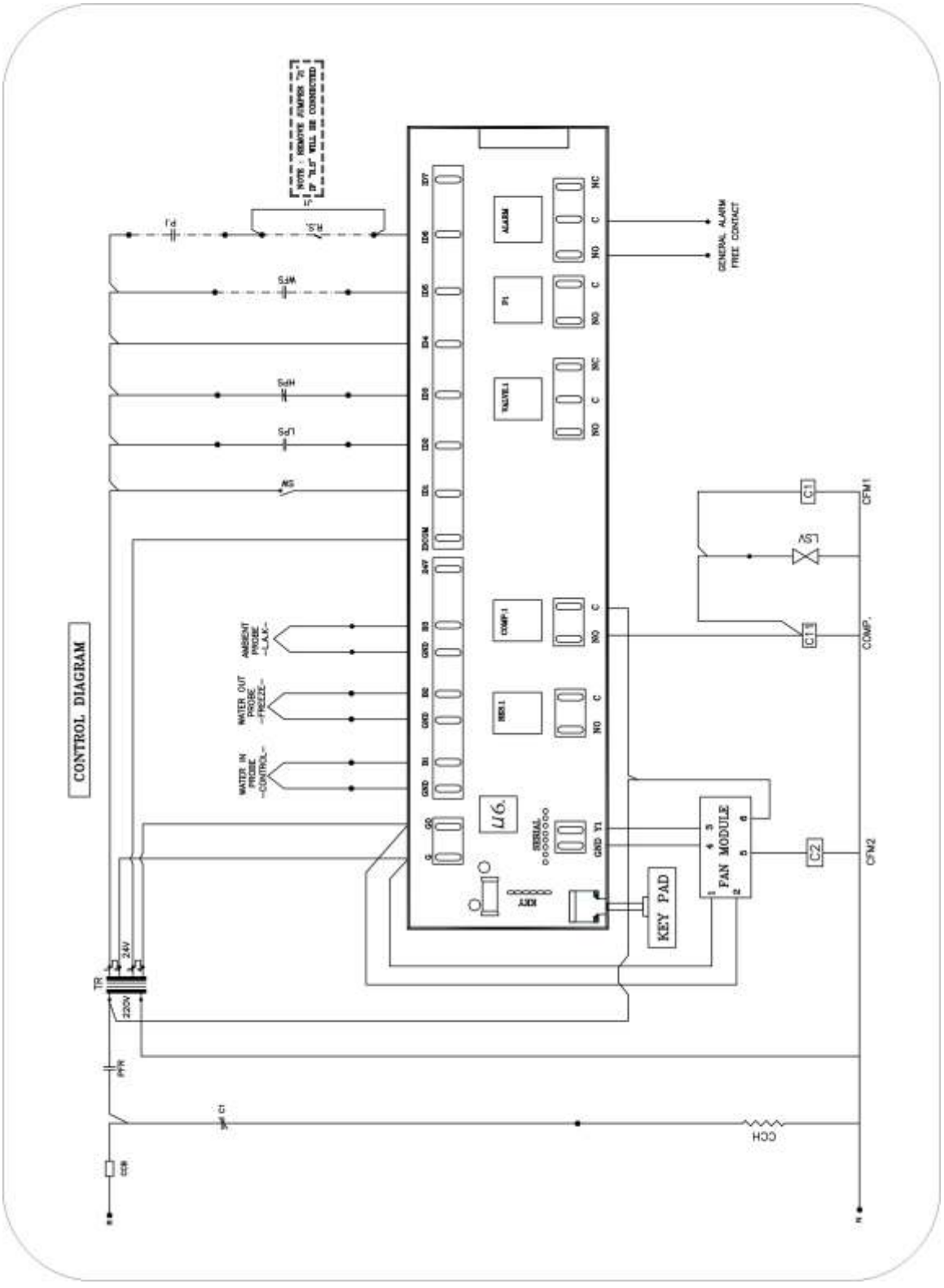


B	Low Pressure Switch.	STD
A	Hi Pressure Switch.	STD
#	CONTROLLER	STATUS

13	Low Pressure Gauge.	OPTION
12	Charging Nipple.	STD
11	Suction Accumalator.H.E	STD
10	Cooler.	STD
9	Expansion Valve.	STD
8	Sight Glass.	OPTION
7	Filter Drier.	STD
6	Shut Off Valve.	STD
5	Check Valve.	STD
4	Condenser Coil.	STD
3	Reversing Valve(4-Way Valve).	STD
2	Hi Pressure Gauge.	OPTION
1	Hermatic Compressor.	STD
#	ITEM	STATUS

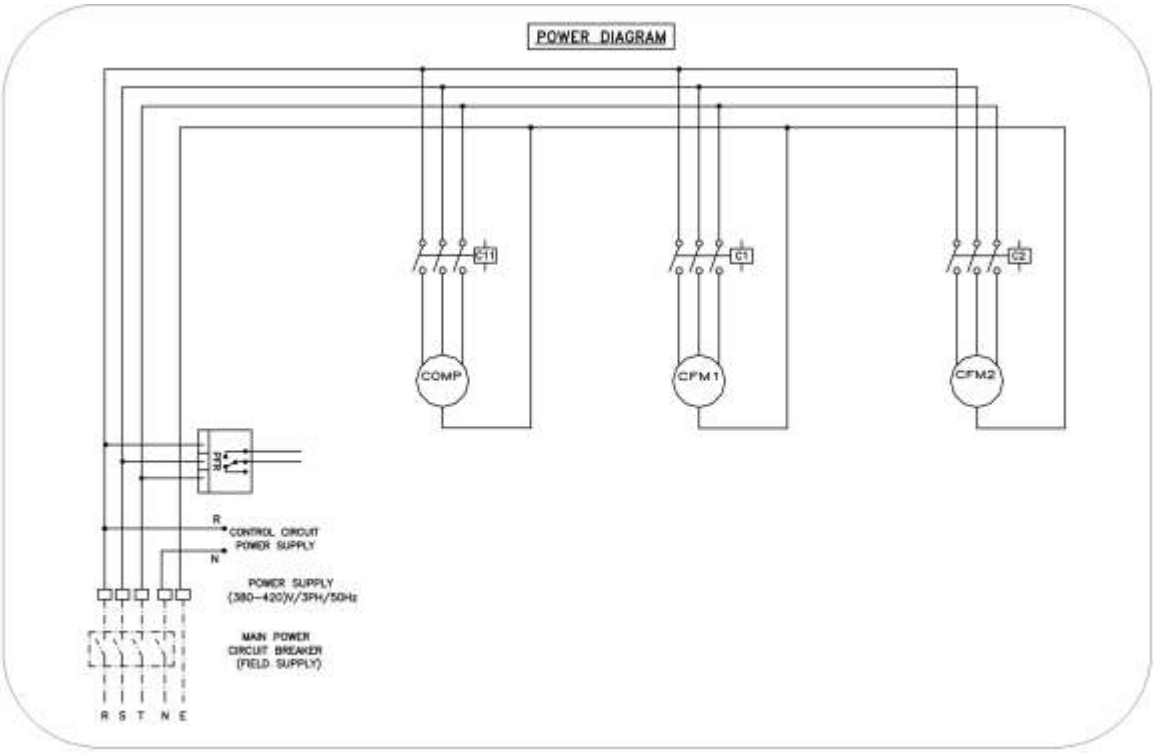
WIRING DIAGRAM

One Stage (Cooling Only Units)



WIRING DIAGRAM

One Stage (Cooling Only Units)



LISTS & TABLES

LEGEND			
R.S	REMOTE SWITCH	HPS	HIGH PRESSURE SWITCH
C	CONTACTOR	LPS	LOW PRESSURE SWITCH
CCB	CONTROL CIRCUIT BREAKER	P.I	PUMP INTERLOCK
CCH	CRANKCASE HEATER	PFR	PHASE FAILURE RELAY
CFM	CONDENSER FAN MOTOR	SW	ON/OFF SWITCH
WFS	WATER FLOW SWITCH	Wn	WIRING NUMBER
COMP.	COMPRESSOR	On	TERMINAL NUMBER
TR	TRANSFORMER (220/24V)	- - - -	FIELD CONNECTION (BY OTHERS)
L.A.K	LOW AMBIENT KIT		

MESSAGES	
CODE	MEANING
H1	SWITCH
L1	LOW PRESSURE CIRCUIT
C1	HIGH PRESSURE CIRCUIT
FL	FLOW RATE(WFS)
E1	WATER IN PROBE FAULT
E2	WATER OUT PROBE FAULT
E3	AMBIENT TEMPERATURE PROBE-L.A.K-
Cn	ERROR IN COMMUNICATION WITH KEYPAD
A1	ANTIFREEZE PROTECTION

PFR INDICATOR LIGHT DIAGNOSTICS	
RUN	GREEN
RESTART DELAY	GREEN
REVERSE PHASE	RED
UNBALANCE/SINGLE PHASE	RED
HIGH/LOW VOLTAGE	RED

NOTE:
- *TO SILENCE THE BUZZER AFTER ALARM SITUATION PRESS (Mute)BUTTON.
- *TO RESET THE CONTROLLER AFTER ALARM SITUATION PRESS (Clear) BUTTON FOR 5Sec.
- *INCASE OF KEYPAD OFF,CHECK : P.I,R.S

ACCESS TO SET POINT

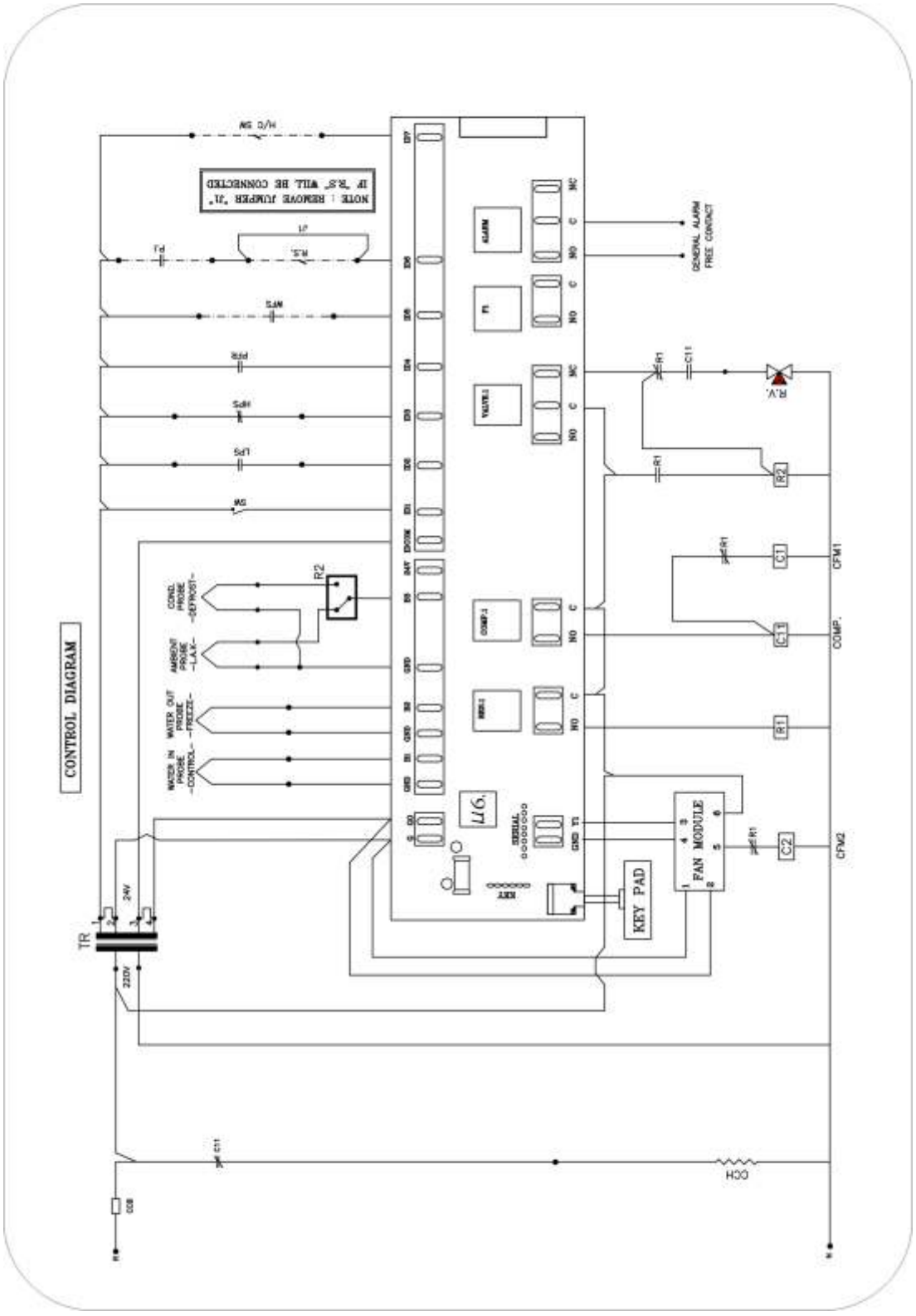
COOLING SET POINT :

BY PUSHING THE SEL BUTTON FOR 5 Sec.YOU WILL SEE ON THE DISPLAY PARAM. (r1)
PUSH THE SEL BUTTON AGAIN TO DISPLAY THE SET VALUE
IN THIS MODE YOU CAN CHANGE THE SET POINT BY PUSHING THE UP AND DOWN ARROWS.
THEN PUSH THE SEL BUTTON AGAIN TO EXIT AND (PRG) FOR STORING THIS VALUE AND TO RETURN TO THE MAIN MENU

* FOLLOW THE SAME PROCEDURE TO VIEW WATER OUT TEMP.(r6), AMBIENT TEMP.(R8)

WIRING DIAGRAM

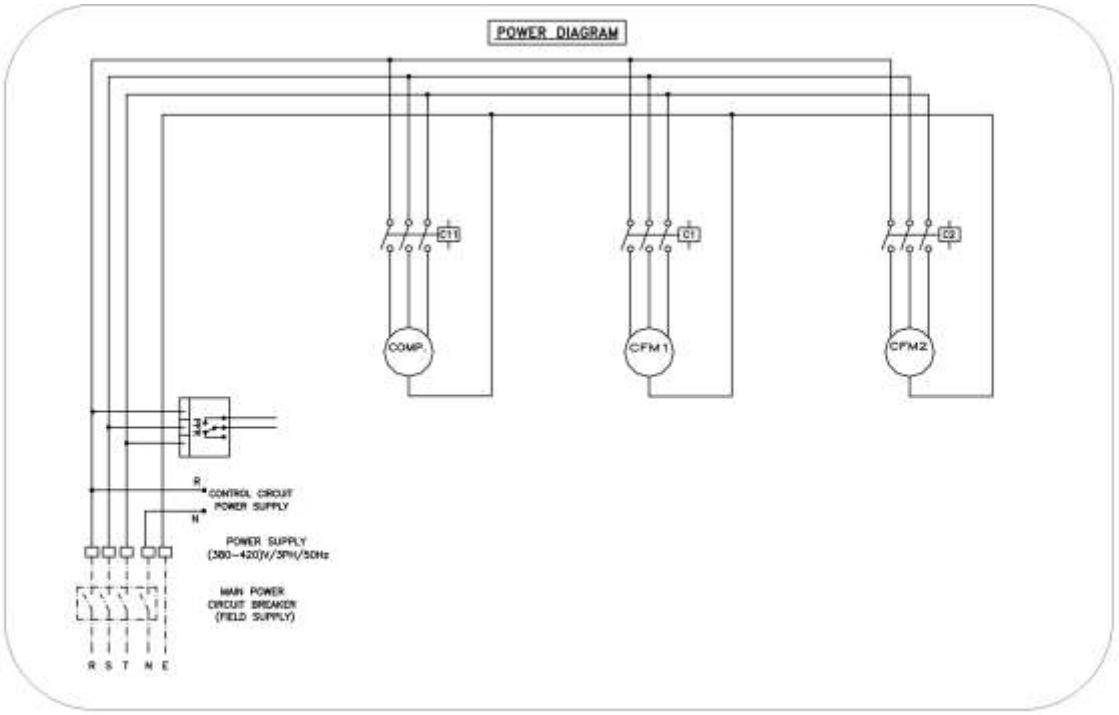
One Stage (Optional Heat Pump Units)



WIRING DIAGRAM

One Stage (Optional Heat Pump Units)

POWER DIAGRAM



LISTS & TABLES

LEGEND

R.S	REMOTE SWITCH	R.V.	REVERSE VALVE
C	CONTACTOR	HPS	HIGH PRESSURE SWITCH
CCB	CONTROL CIRCUIT BREAKER	LPS	LOW PRESSURE SWITCH
CCH	CRANKCASE HEATER	P.I	PUMP INTERLOCK
CFM	CONDENSER FAN MOTOR	PFR	PHASE FAILURE RELAY
WFS	WATER FLOW SWITCH	R	CONTROL RELAY
COMP.	COMPRESSOR	L.A.K	LOW AMBIENT KIT
TR	TRANSFORMER (220/24V)	Wn	WIRING NUMBER
SW	ON/OFF SWITCH	On	TERMINAL NUMBER
H/C SW	HEAT /COOL SWITCH	- - - -	FIELD CONNECTION (BY OTHERS)

ACCESS TO SET POINT

COOLING SET POINT :

BY PUSHING THE SEL BUTTON FOR 5 Sec.YOU WILL SEE ON THE DISPLAY PARAM. (r1)
PUSH THE SEL BUTTON AGAIN TO DISPLAY THE SET VALUE
IN THIS MODE YOU CAN CHANGE THE SET POINT BY PUSHING THE UP AND DOWN ARROWS.
THEN PUSH THE SEL BUTTON AGAIN TO EXIT AND (PRG) FOR STORING THIS VALUE AND TO RETURN TO THE MAIN MENU

HEATING SET POINT :

BY PUSHING THE SEL BUTTON FOR 5 Sec.YOU WILL SEE ON THE DISPLAY PARAM. (r1) ,PUSH THE DOWN ARROW TO SEE PARAM (r3)
PUSH THE SEL BUTTON AGAIN TO DISPLAY THE SET VALUE
IN THIS MODE YOU CAN CHANGE THE SET POINT BY PUSHING THE UP AND DOWN ARROWS.
THEN PUSH THE SEL BUTTON AGAIN TO EXIT AND (PRG) FOR STORING THIS VALUE AND TO RETURN TO THE MAIN MENU

MESSAGES

CODE	MEANING
H1	SWITCH
L1	LOW PRESSURE CIRCUIT
C1	HIGH PRESSURE CIRCUIT
F1	PHASE FAILURE
FL	FLOW RATE(WFS)
E1	WATER IN PROBE FAULT
E2	WATER OUT PROBE FAULT
E3	COND. TEMPERATURE PROBE (HEATING)
E3	AMBIENT TEMPERATURE PROBE (COOLING)
Cn	ERROR IN COMMUNICATION WITH KEYPAD
A1	ANTIFREEZE PROTECTION
d1	CIRCUIT IN DEFROST
r1	CIRCUIT DEFROSTING ERROR

NOTE: *TO SILENCE THE BUZZER AFTER ALARM SITUATION PRESS (Mute)BUTTON.
*TO RESET THE CONTROLLER AFTER ALARM SITUATION PRESS (Clear) BUTTON FOR 5Sec.
*INCASE OF KEYPAD OFF,CHECK : P.I,R.S

PFR INDICATOR LIGHT DIAGNOSTICS	
RUN	GREEN
RESTART DELAY	FLASHING GREEN
REVERSE PHASE	FLASHING RED
UNBALANCE/SINGLE PHASE	FLASHING RED
HIGH/LOW VOLTAGE	RED

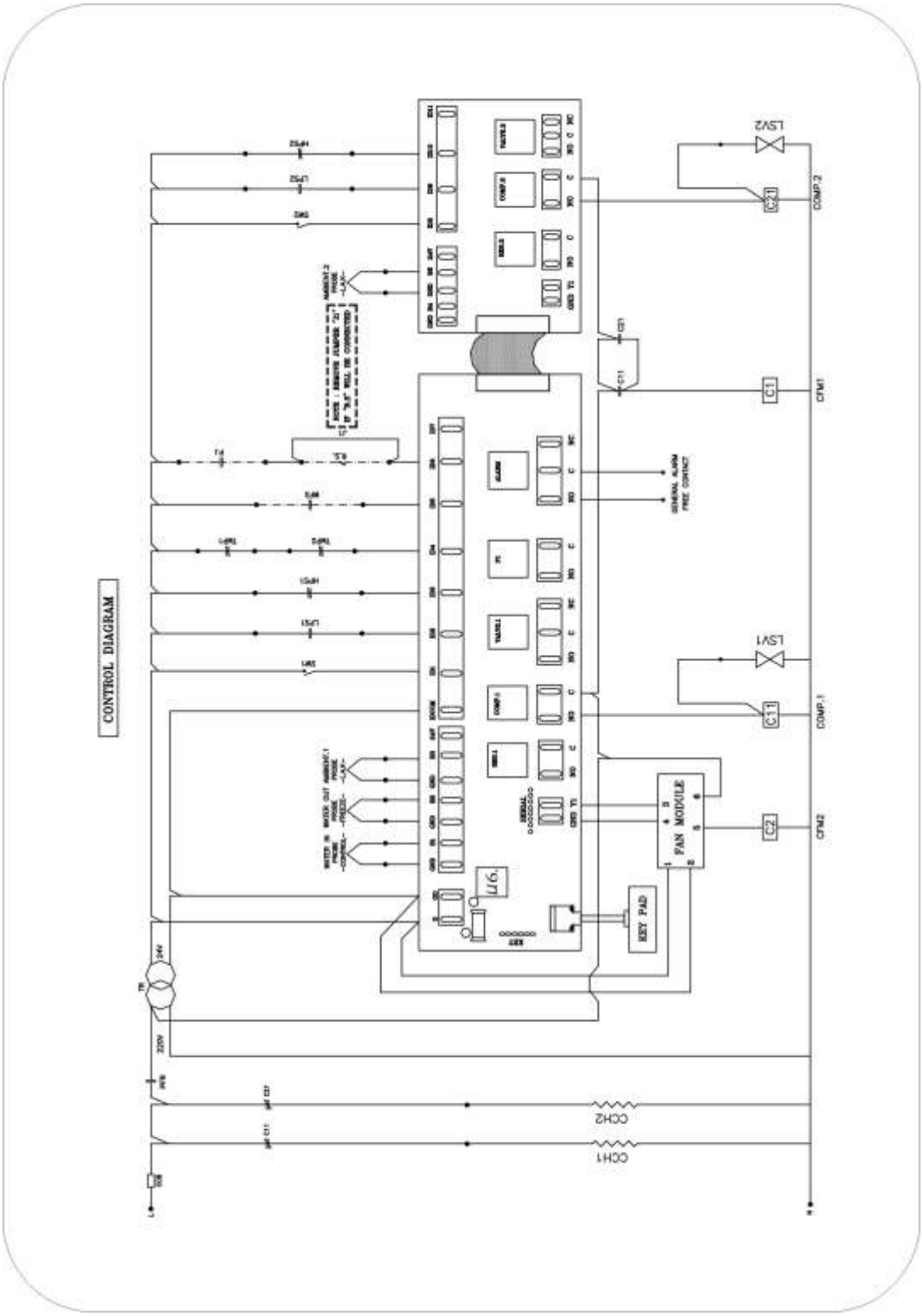
PROBES

BY PUSHING THE (SEL) BUTTON FOR 5 Sec.YOU WILL SEE ON THE DISPLAY PARAMETER. (r1),NOW USE UP/DOWN ARROWS TO SCROLL THROUGH THE PARAMETERS.
PRESSING(SEL) AGAIN WILL DISPLAY THE VALUE

r6	WATER OUT PROBE TEMPERATURE
r8	COND. PROBE TEMPERATURE (HEATING)
r8	AMB. PROBE TEMPERATURE (COOLING)

WIRING DIAGRAM

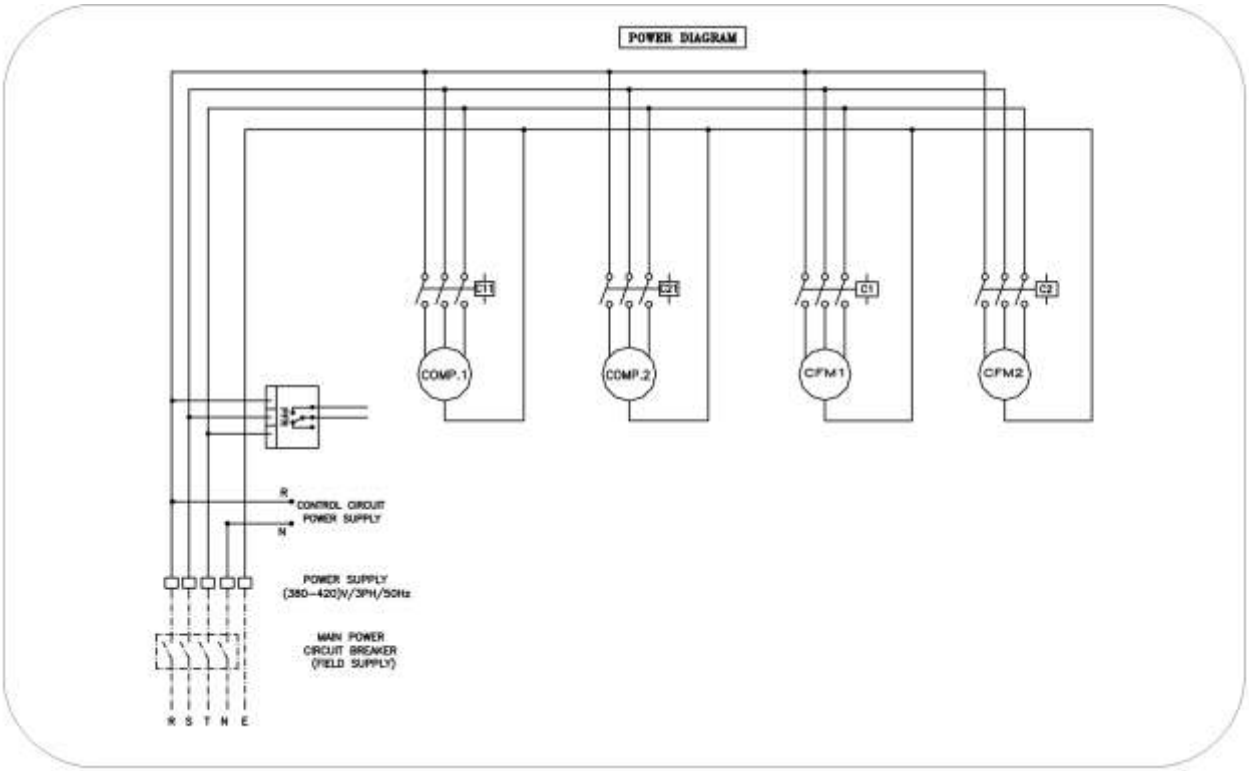
Two Stage (Cooling Only Units)



WIRING DIAGRAM

Two Stage (Cooling Only Units)

POWER DIAGRAM



LISTS & TABLES

MESSAGES

CODE	MEANING
H1	SWITCH1
L1	LOW PRESSURE CIRCUIT.1
C1	HIGH PRESSURE CIRCUIT.1
F1	CFM THERMAL MOTOR PROTECTION(TMP1,TMP2)
FL	FLOW RATE(WFS)
H2	SWITCH2
L2	LOW PRESSURE CIRCUIT.2
C2	HIGH PRESSURE CIRCUIT.2
E1	WATER IN PROBE FAULT
E2	WATER OUT PROBE FAULT
E3	AMBIENT PROBE.1 FAULT –L.A.K–
E5	AMBIENT PROBE.2 FAULT –L.A.K–
A1	ANTIFREEZE PROTECTION
Cn	ERROR IN COMMUNICATION WITH KEYPAD

NOTE:
*TO SILENCE THE BUZZER AFTER ALARM SITUATION PRESS (Mute)BUTTON.
*TO RESET THE CONTROLLER AFTER ALARM SITUATION PRESS (Clear) BUTTON FOR 5Sec.
*IN CASE OF REMOTE OFF CHECK : R.S,P.I

ACCESS TO SET POINT

COOLING SET POINT :

BY PUSHING THE SEL BUTTON FOR 5 Sec.YOU WILL SEE ON THE DISPLAY PARAM. (r1)
PUSH THE SEL BUTTON AGAIN TO DISPLAY THE SET VALUE
IN THIS MODE YOU CAN CHANGE THE SET POINT BY PUSHING THE UP AND DOWN ARROWS.
THEN PUSH THE SEL BUTTON AGAIN TO EXIT AND (PRG) FOR STORING THIS VALUE AND TO RETURN TO THE MAIN MENU

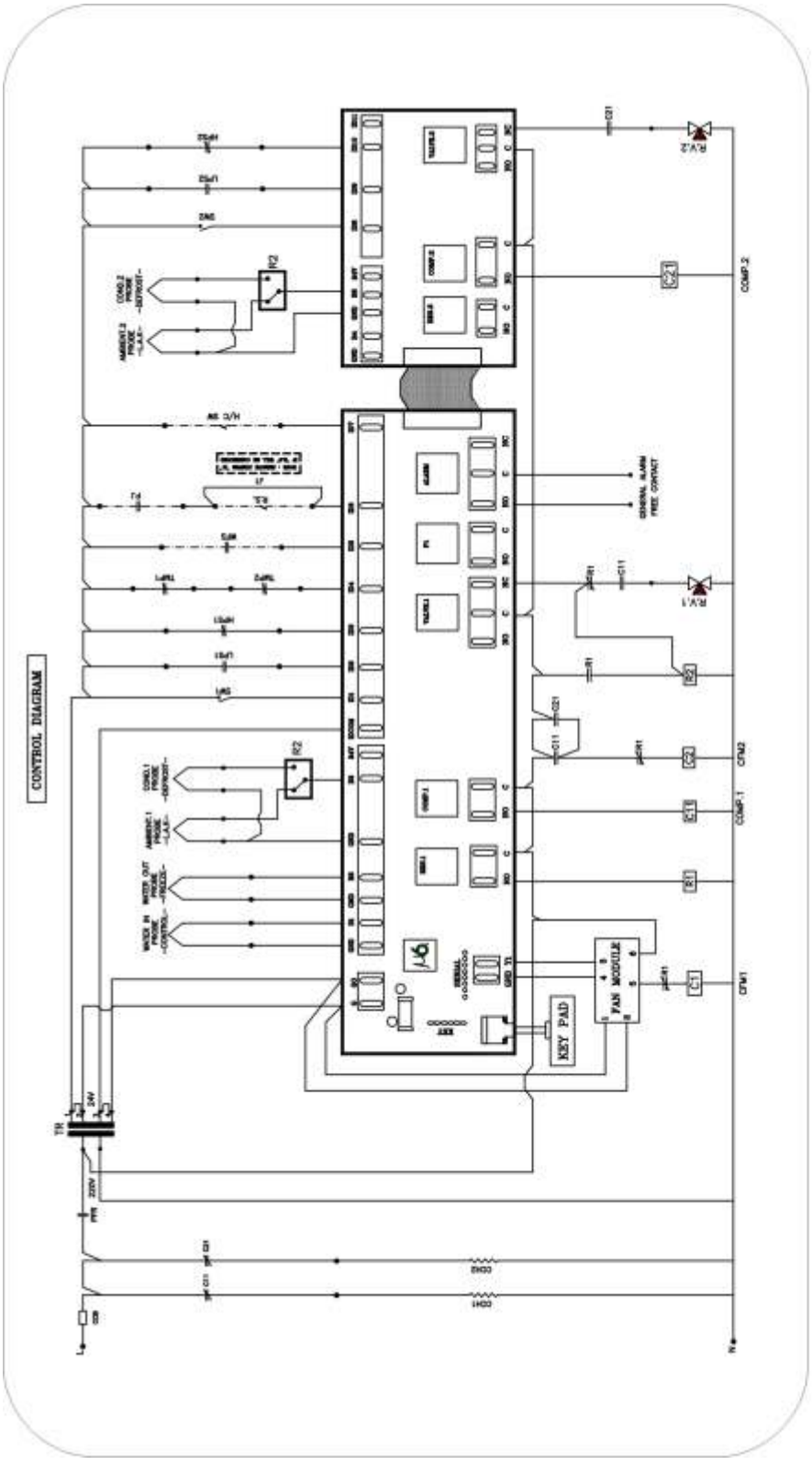
* FOLLOW THE SAME PROCEDURE TO VIEW WATER OUT TEMP.(r6), AMBIENT TEMP.(R8,R9)

LEGEND

R.S	REMOTE SWITCH	HPS	HIGH PRESSURE SWITCH
C	CONTACTOR	LPS	LOW PRESSURE SWITCH
CCB	CONTROL CIRCUIT BREAKER	LSV	LIQUID SOLENOID VALVE
CCH	CRANKCASE HEATER	L.A.K	LOW AMBIENT KIT
CFM	CONDENSER FAN MOTOR	P.I	PUMP INTERLOCK
WFS	WATER FLOW SWITCH	PFR	PHASE FAILURE RELAY
COMP.	COMPRESSOR	SW	ON/OFF SWITCH
TR	TRANSFORMER (220/24V)	Wn	WIRING NUMBER
TMP	THERMAL MOTOR PROTECTOR	On	TERMINAL NUMBER
		------	FIELD CONNECTION (BY OTHERS)

WIRING DIAGRAM

Two Stage (Optional Heat Pump Units)



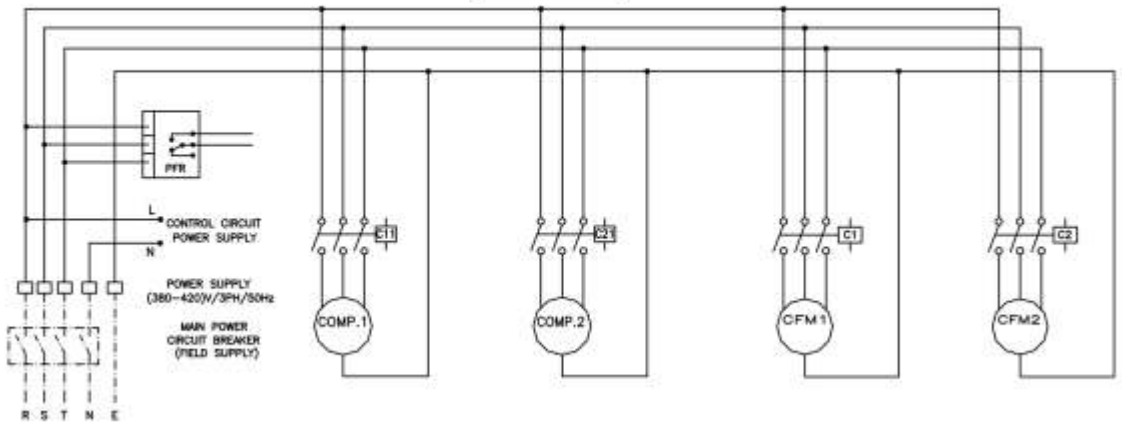
LEGEND

R.S	REMOTE SWITCH	R	CONTROL RELAY
C	CONTACTOR	HPS	HIGH PRESSURE SWITCH
CCB	CONTROL CIRCUIT BREAKER	LPS	LOW PRESSURE SWITCH
CCH	CRANKCASE HEATER	PFR	PHASE FAILURE RELAY
CFM	CONDENSER FAN MOTOR	H/C SW	HEAT/COOL SWITCH
WFS	WATER FLOW SWITCH	R.V	REVERSE VALVE
COMP.	COMPRESSOR	L.A.K	LOW AMBIENT KIT
TR	TRANSFORMER (220/24V)	PCB	POWER CIRCUIT BREAKER
SW	ON/OFF SWITCH	Wn	WIRING NUMBER
TMP	THERMAL MOTOR PROTECTOR	On	TERMINAL NUMBER
OL	OVERLOAD RELAY	------	FIELD CONNECTION (BY OTHERS)

WIRING DIAGRAM

Two Stage (Optional Heat Pump Units)

POWER DIAGRAM



LISTS & TABLES

MESSAGES

CODE	MEANING
H1	SWITCH1
L1	LOW PRESSURE CIRCUIT.1
C1	HIGH PRESSURE CIRCUIT.1
F1	CFM THERMAL MOTOR PROTECTION(TMP1,TMP2)
FL	FLOW RATE(WFS)
H2	SWITCH2
L2	LOW PRESSURE CIRCUIT.2
C2	HIGH PRESSURE CIRCUIT.2
E1	WATER IN PROBE FAULT
E2	WATER OUT PROBE FAULT
E3	AMBIENT.1 TEMPERATURE PROBE (COOLING)
E3	COND.1 TEMPERATURE PROBE (HEATING)
E5	AMBIENT.2 TEMPERATURE PROBE (COOLING)
E5	COND.2 TEMPERATURE PROBE (HEATING)
A1	ANTIFREEZE PROTECTION
Cn	ERROR IN COMMUNICATION WITH KEYPAD
d1	CIRCUIT.1 IN DEFROST
d2	CIRCUIT.2 IN DEFROST
r1	CIRCUIT.1 DEFROSTING ERROR
r2	CIRCUIT.2 DEFROSTING ERROR

NOTE: *TO SILENCE THE BUZZER AFTER ALARM SITUATION PRESS (Mute)BUTTON.
*TO RESET THE CONTROLLER AFTER ALARM SITUATION PRESS (Clear) BUTTON FOR 5Sec.
*INCASE OF KEYPAD OFF,CHECK : P.I,R.S

ACCESS TO SET POINT

COOLING SET POINT :

BY PUSHING THE SEL BUTTON FOR 5 Sec.YOU WILL SEE ON THE DISPLAY PARAM. (r1)
PUSH THE SEL BUTTON AGAIN TO DISPLAY THE SET VALUE
IN THIS MODE YOU CAN CHANGE THE SET POINT BY PUSHING THE UP AND DOWN ARROWS.
THEN PUSH THE SEL BUTTON AGAIN TO EXIT AND (PRG) FOR STORING THIS VALUE AND TO RETURN TO THE MAIN MENU

HEATING SET POINT :

BY PUSHING THE SEL BUTTON FOR 5 Sec.YOU WILL SEE ON THE DISPLAY PARAM. (r1) ,PUSH THE DOWN ARROW TO SEE PARAM (r3)
PUSH THE SEL BUTTON AGAIN TO DISPLAY THE SET VALUE
IN THIS MODE YOU CAN CHANGE THE SET POINT BY PUSHING THE UP AND DOWN ARROWS.
THEN PUSH THE SEL BUTTON AGAIN TO EXIT AND (PRG) FOR STORING THIS VALUE AND TO RETURN TO THE MAIN MENU

PROBES

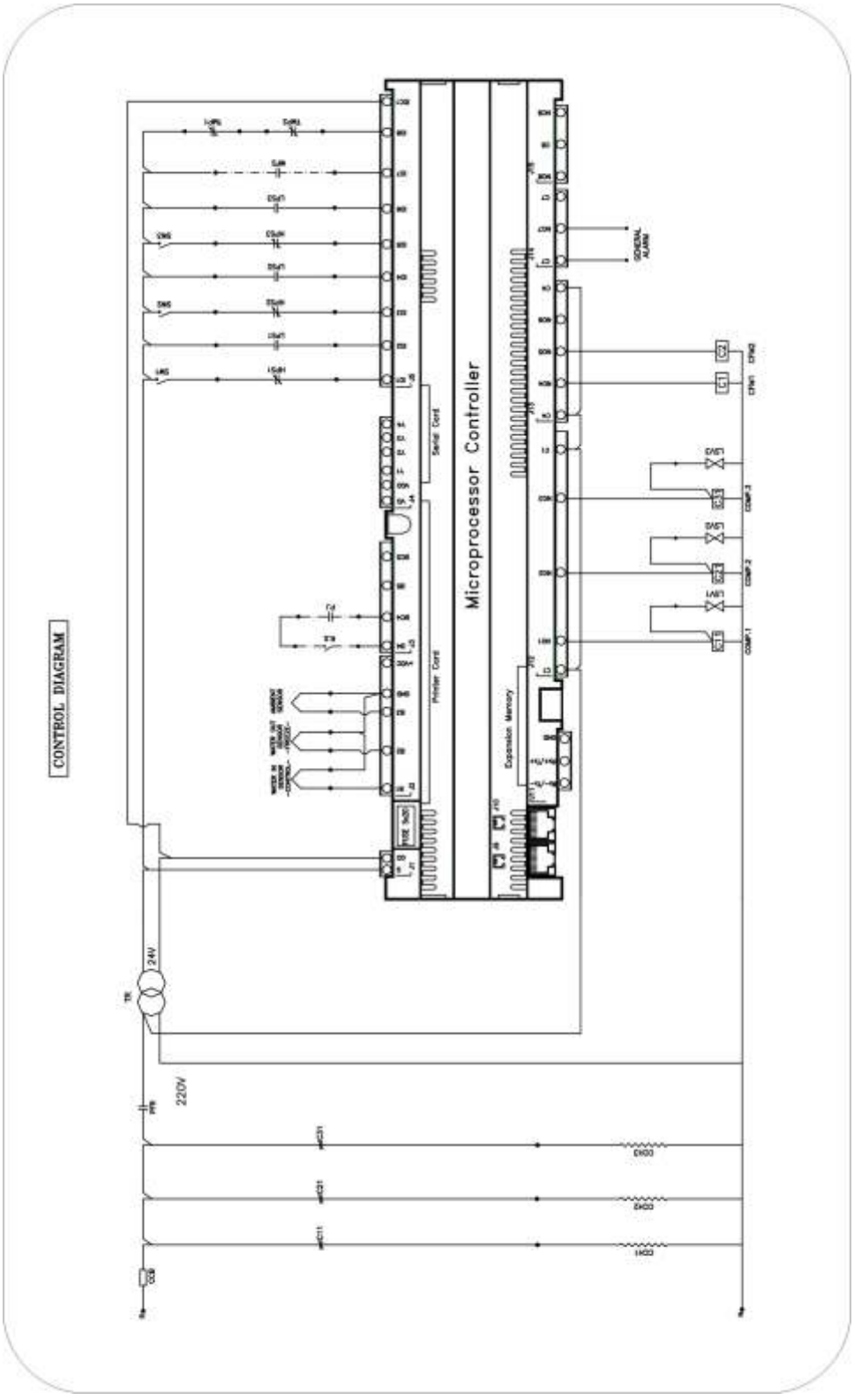
BY PUSHING THE (SEL) BUTTON FOR 5 Sec.YOU WILL SEE ON THE DISPLAY PARAM. (r1),NOW USE UP/DOWN ARROWS TO SCROLL THROUGH THE PARAMES.
PRESSING(SEL) AGAIN WILL DISPLAY THE VALUE

r6	WATER OUT PROBE TEMPERATURE
r8	AMBIENT.1 PROBE TEMPERATURE (COOLING)
r8	COND.1 PROBE TEMPERATURE (HEATING)
r9	AMBIENT.2 PROBE TEMPERATURE (COOLING)
r9	COND.2 PROBE TEMPERATURE (HEATING)

PFR INDICATOR LIGHT DIAGNOSTICS	
RUN	GREEN
RESTART DELAY	GREEN
REVERSE PHASE	RED
UNBALANCE/SINGLE PHASE	RED
HIGH/LOW VOLTAGE	RED

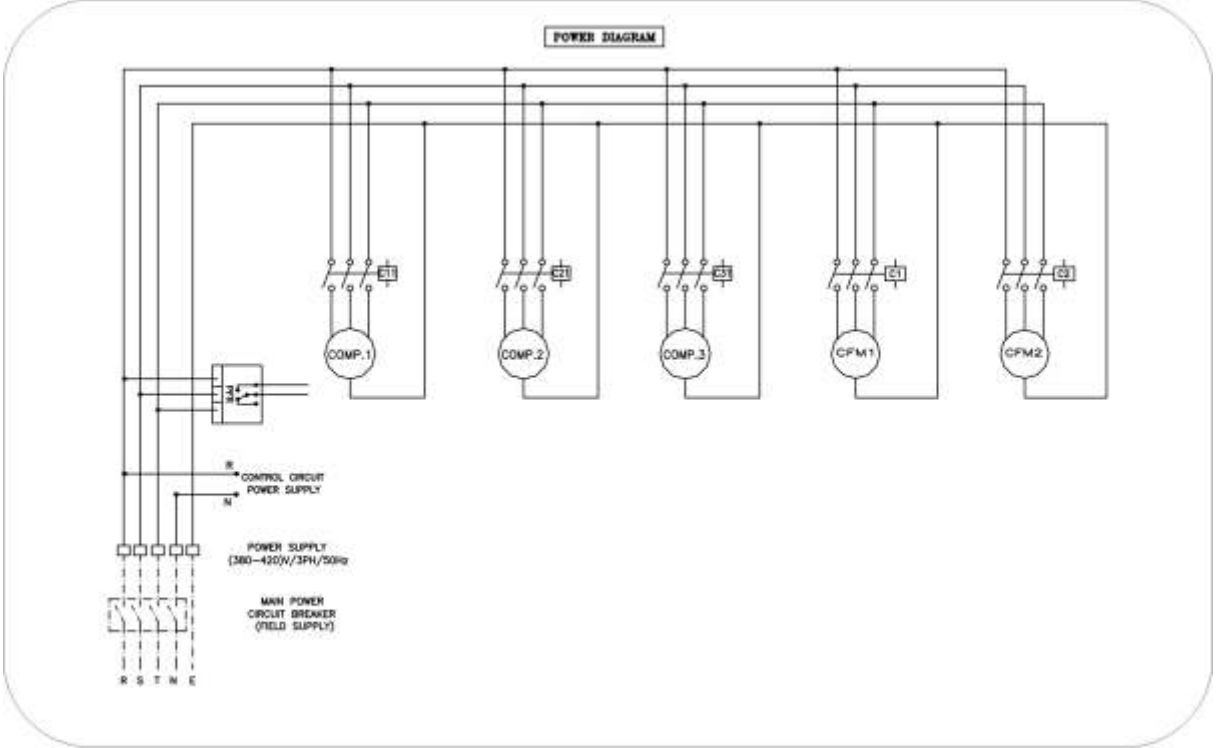
WIRING DIAGRAM

Three Stage (Cooling Only Units)



WIRING DIAGRAM

Three Stage (Cooling Only Units)



LISTS & TABLES

LEGEND			
R.S	REMOTE SWITCH	HPS	HIGH PRESSURE SWITCH
C	CONTACTOR	LPS	LOW PRESSURE SWITCH
CCB	CONTROL CIRCUIT BREAKER	LSV	LIQUID SOLENOID VALVE
CCH	CRANKCASE HEATER	MP	MOTOR PROTECTOR
CFM	CONDENSER FAN MOTOR	P.I	PUMP INTERLOCK
WFS	WATER FLOW SWITCH	PFR	PHASE FAILURE RELAY
COMP.	COMPRESSOR	TMP	THERMAL MOTOR PROTECTOR
TR	TRANSFORMER (220/24V)/75VA	Wn	WIRING NUMBER
SW	ON/OFF SWITCH	On	TERMINAL NUMBER
		— — —	FIELD CONNECTION (BY OTHERS)

ERROR CONDITION

1 * ANY ABNORMAL CONDITION COULD HAPPENED THE CONTROLLER WILL AUTOMATICALLY SWITCH OFF THE CONCERNED CIRCUIT OR THE WHOLE CHILLER DEPENDING ON ALARM TYPE, THEN IT WILL GIVE ALARM MESSAGE AND THE CONTROLLER WILL ENERGIZE THE GENERAL ALARM RELAY.

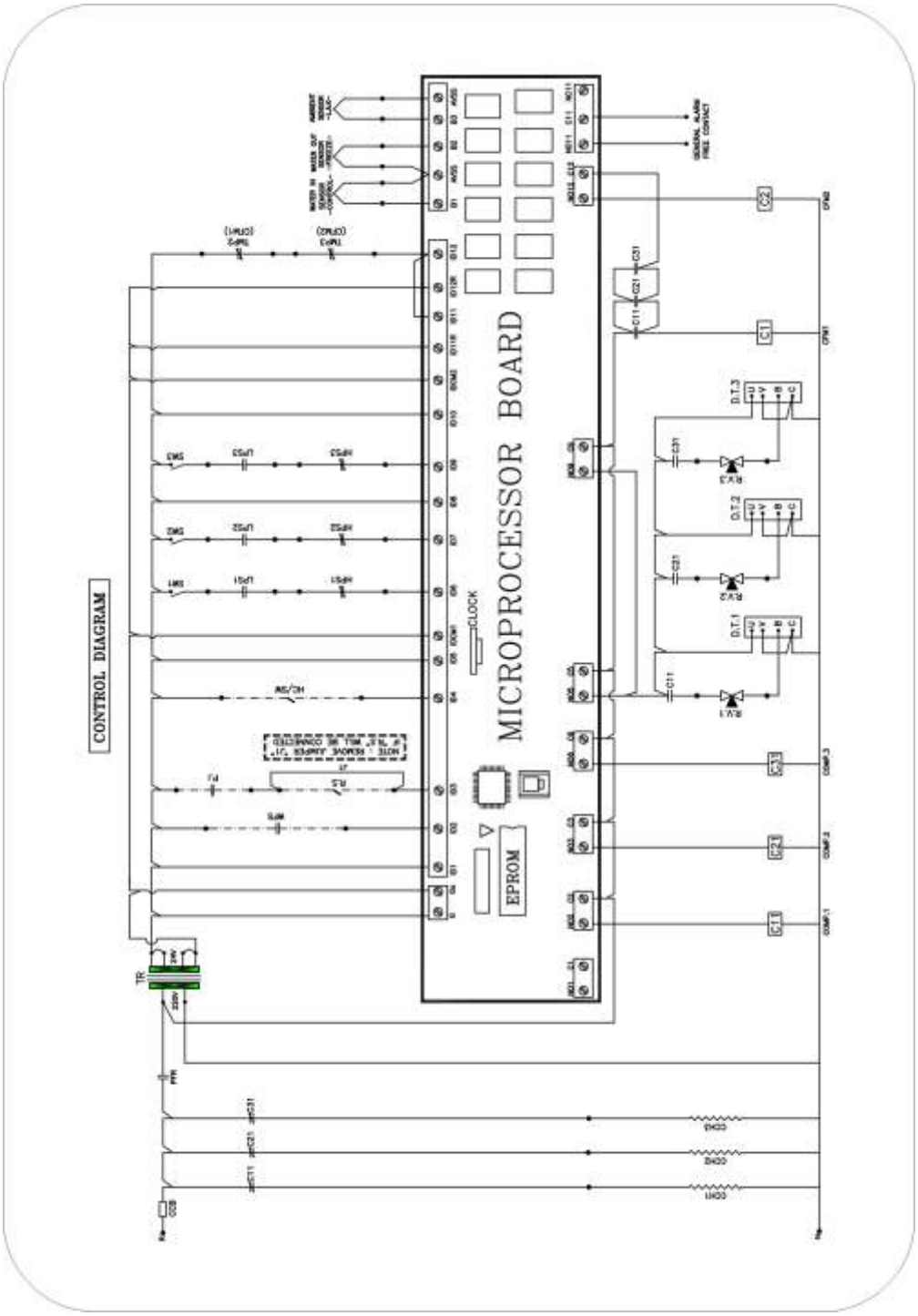
2 * IF THIS CONDITION HAPPENED, PUSH THE ALARM BUTTON TO DISPLAY THE ALARM MESSAGE.

3 * AFTER FIXING THE ALARM,TO RESET THE ALARM PUSH ALARM BUTTON AGAIN.

PFR INDICATOR LIGHT DIAGNOSTICS	
RUN	GREEN
RESTART DELAY	GREEN
REVERSE PHASE	RED
UNBALANCE/SINGLE PHASE	RED
HIGH/LOW VOLTAGE	RED

WIRING DIAGRAM

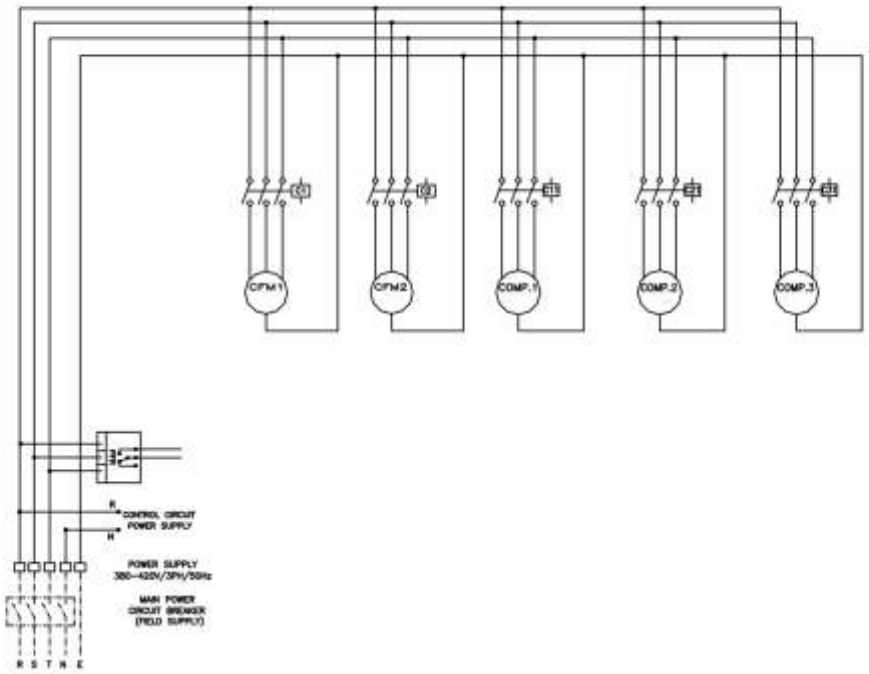
Three Stage (Optional Heat Pump Units)



WIRING DIAGRAM

Three Stage (Optional Heat Pump Units)

POWER DIAGRAM



LISTS & TABLES

LEGEND			
PCO	PROGRAMMABLE CONTROLLER	LPS	LOW PRESSURE SWITCH
C	CONTACTOR	TMP	THERMAL MOTOR PROTECTION
CCH	CRANK CASE HEATER	SW	SWITCH
CFM	CONDENSER FAN MOTOR	L.A.K	LOW AMBIENT KIT
CCB	CONTROL CIRCUIT BREAKER	R.S	REMOTE ON/OFF SWITCH
COMP.	COMPRESSOR	PFR	PHASE FAILURE RELAY
R.V	REVERSE VALVE	H/C SW	HEAT/COOL SWITCH
HPS	HIGH PRESSURE SWITCH	On	TERMINAL NUMBER
WFS	WATER FLOW SWITCH	Wn	WIRING NUMBER
PI	PUMP INTERFACE	----------	FIELD CONNECTION (BY OTHERS)
D.T	DEFROST TIMER	PROGRAM CODE	PCO CHA

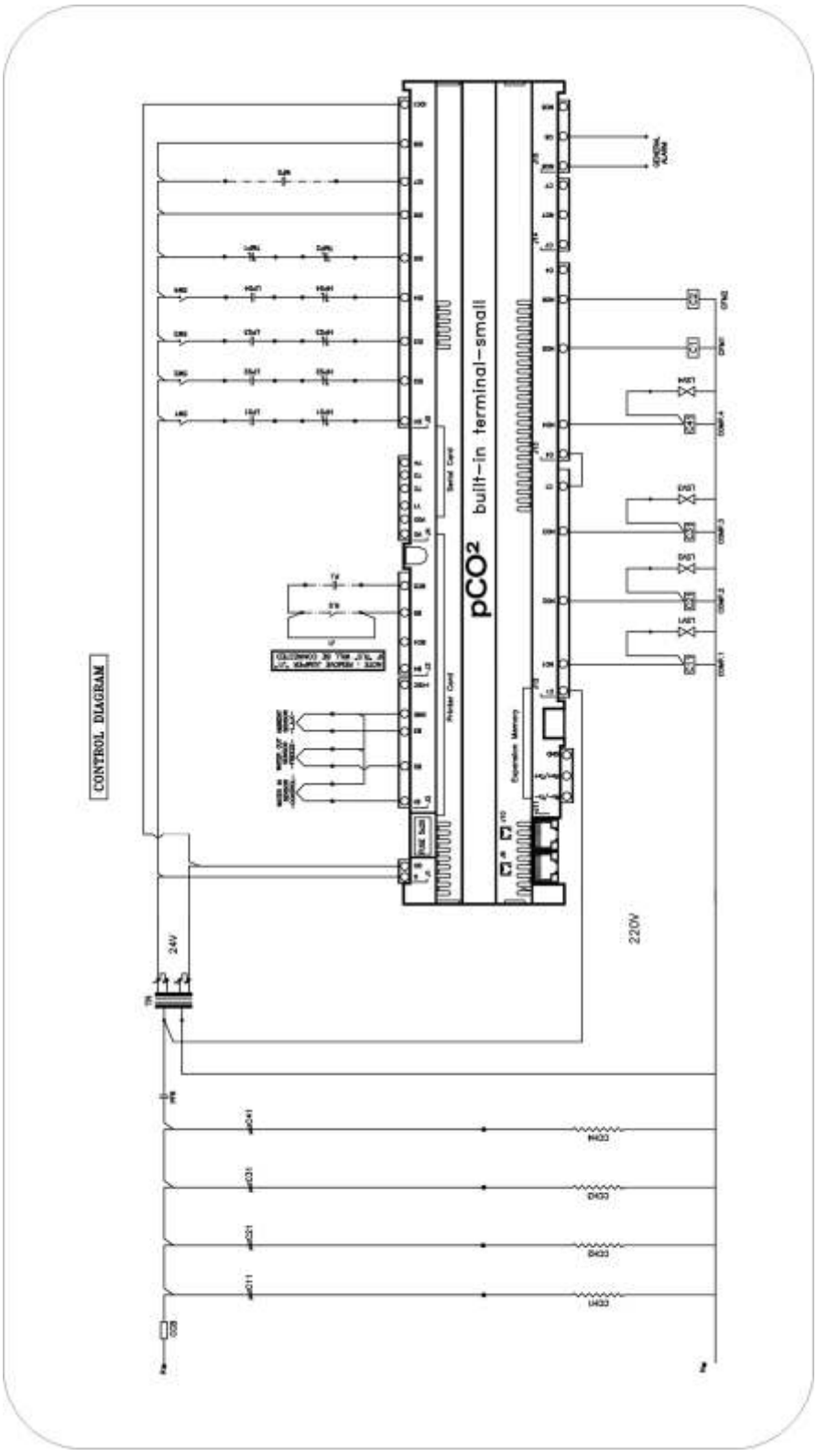
ERROR CONDITION

1.* ANY ABNORMAL CONDITION COULD HAPPENS THE CONTROLLER WILL AUTOMATICALLY SWITCH OFF THE CONCERNED CIRCUIT OR THE WHOLE CHILLER DEPENDING ON ALARM TYPE, THEN IT WILL GIVE A BUZZER SOUND AND ALARM MESSAGE AND THE CONTROLLER WILL ENERGIZE THE GENERAL ALARM RELAY.
2.* IF THIS CONDITION HAPPENED, PUSH THE ALARM BUTTON TO SILENCE THE BUZZER THEN ⊖ OR ⊕ TO DISPLAY THE MESSAGE OF THE ALARM
3.* AFTER FIXING THE ALARM,TO RESET THE ALARM PUSH ALARM BUTTON AGAIN.
4.* IN CASE OF "FREEZE ALARM " IT MEANS ONE OF THE FOLLOWING:
-FREEZE CONDITION
-WATER OUT SENSOR (32) ISN'T CONNECTED OR DOESN'T OPERATE

PFR INDICATOR LIGHT DIAGNOSTICS	
RUN	GREEN
RESTART DELAY	GREEN
REVERSE PHASE	RED
UNBALANCE/SINGLE PHASE	RED
HIGH/LOW VOLTAGE	RED

WIRING DIAGRAM

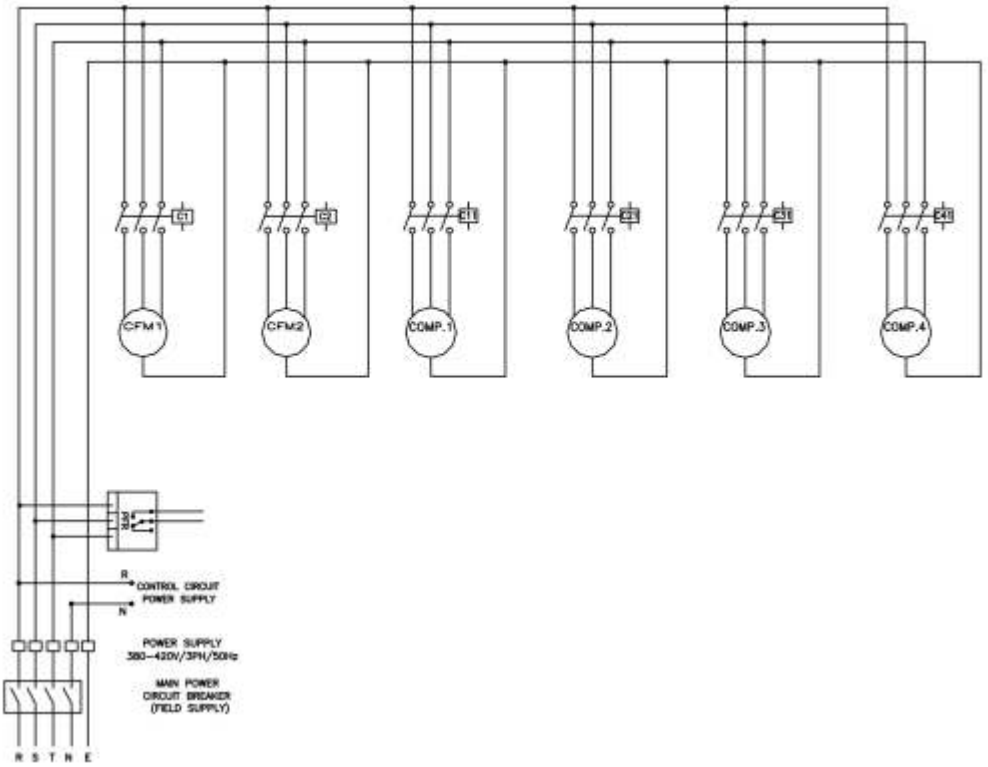
Four Stage (Cooling Only Units)



WIRING DIAGRAM

Four Stage (Cooling Only Units)

POWER DIAGRAM



LISTS & TABLES

LEGEND			
R.S	REMOTE SWITCH	HPS	HIGH PRESSURE SWITCH
C	CONTACTOR	LPS	LOW PRESSURE SWITCH
CCB	CONTROL CIRCUIT BREAKER	LSV	LIQUID SOLENOID VALVE
CCH	CRANKCASE HEATER	P.I	PUMP INTERLOCK
CFM	CONDENSER FAN MOTOR	PFR	PHASE FAILURE RELAY
WFS	WATER FLOW SWITCH	TMP	THERMAL MOTOR PROTECTOR
COMP.	COMPRESSOR	Wn	WIRING NUMBER
TR	TRANSFORMER (220/24V)/75VA	On	TERMINAL NUMBER
SW	ON/OFF SWITCH	- - - -	FIELD CONNECTION (BY OTHERS)
L.A.K	LOW AMBIENT KIT		

ERROR CONDITION

1 * ANY ABNORMAL CONDITION COULD HAPPENED THE CONTROLLER WILL AUTOMATICALLY SWITCH OFF THE CONCERNED CIRCUIT OR THE WHOLE CHILLER DEPENDING ON ALARM TYPE, THEN IT WILL GIVE ALARM MESSAGE AND THE CONTROLLER WILL ENERGIZE THE GENERAL ALARM RELAY.

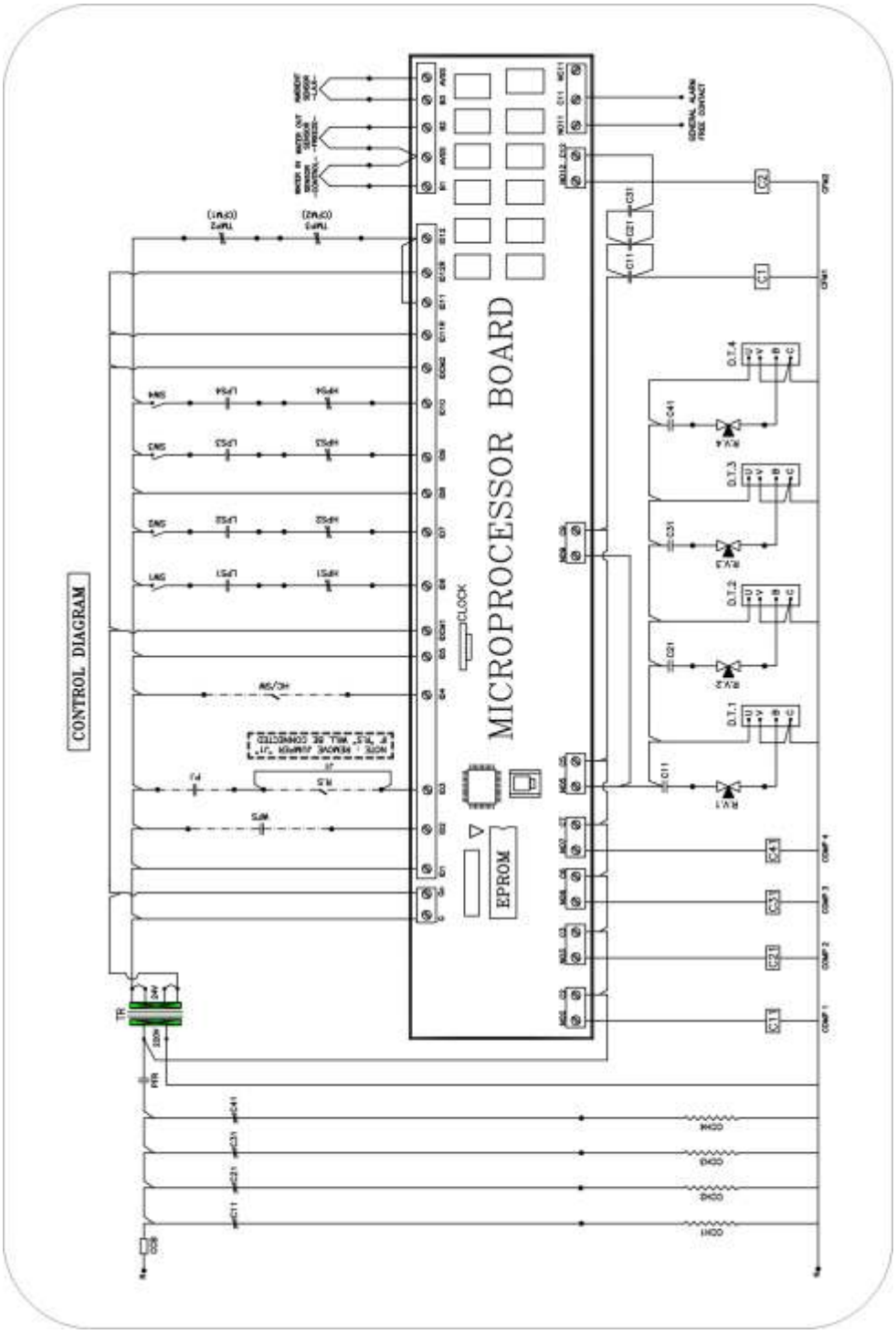
2 * IF THIS CONDITION HAPPENED, PUSH THE ALARM BUTTON TO DISPLAY THE ALARM MESSAGE.

3 * AFTER FIXING THE ALARM,TO RESET THE ALARM PUSH ALARM BUTTON AGAIN.

PFR INDICATOR LIGHT DIAGNOSTICS	
RUN	GREEN
RESTART DELAY	GREEN
REVERSE PHASE	RED
UNBALANCE/SINGLE PHASE	RED
HIGH/LOW VOLTAGE	RED

WIRING DIAGRAM

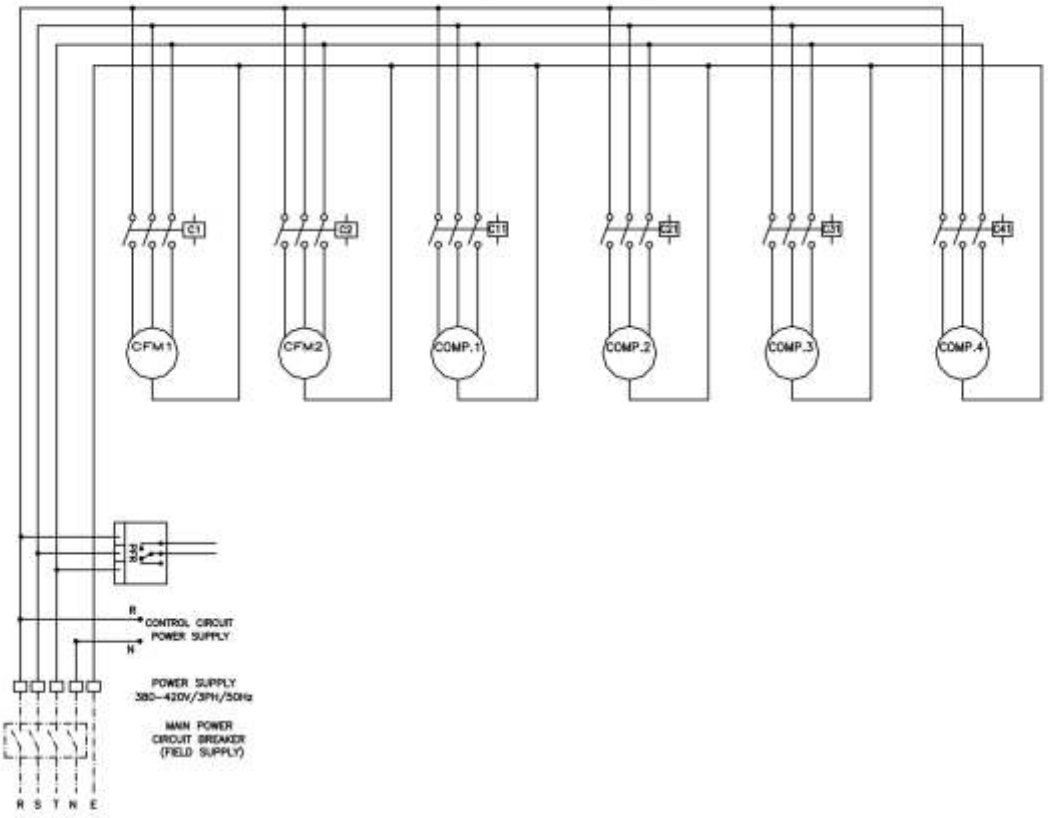
Four Stage (Optional Heat Pump Units)



WIRING DIAGRAM

Four Stage (Optional Heat Pump Units)

POWER DIAGRAM



LISTS & TABLES

LEGEND			
PCO	PROGRAMMABLE CONTROLLER	LPS	LOW PRESSURE SWITCH
C	CONTACTOR	TMP	THERMAL MOTOR PROTECTION
CCH	CRANK CASE HEATER	SW	SWITCH
CFM	CONDENSER FAN MOTOR	L.A.K	LOW AMBIENT KIT
CCB	CONTROL CIRCUIT BREAKER	R.S	REMOTE ON/OFF SWITCH
COMP.	COMPRESSOR	PFR	PHASE FAILURE RELAY
R.V	REVERSE VALVE	H/C SW	HEAT/COOL SWITCH
HPS	HIGH PRESSURE SWITCH	On	TERMINAL NUMBER
WFS	WATER FLOW SWITCH	Wn	WIRING NUMBER
PI	PUMP INTERFACE	- - - -	FIELD CONNECTION (BY OTHERS)
D.T	DEFROST TIMER	PROGRAM CODE	PCO CHA

ERROR CONDITION

1 * ANY ABNORMAL CONDITION COULD HAPPENS THE CONTROLLER WILL AUTOMATICALLY SWITCH OFF THE CONCERNED CIRCUIT OR THE WHOLE CHILLER DEPENDING ON ALARM TYPE. THEN IT WILL GIVE A BUZZER SOUND AND ALARM MESSAGE AND THE CONTROLLER WILL ENERGIZE THE GENERAL ALARM RELAY.

2 * IF THIS CONDITION HAPPENED, PUSH THE ALARM BUTTON TO SILENCE THE BUZZER THEN ⊘ OR ⊘ TO DISPLAY THE MESSAGE OF THE ALARM

3 * AFTER FIXING THE ALARM,TO RESET THE ALARM PUSH ALARM BUTTON AGAIN.

4* IN CASE OF "FREEZE ALARM " IT MEANS ONE OF THE FOLLOWING
-FREEZE CONDITION
-WATER OUT SENSOR (B2) ISN'T CONNECTED OR DOESN'T OPERATE

PFR INDICATOR LIGHT DIAGNOSTICS	
RUN	GREEN
RESTART DELAY	GREEN
REVERSE PHASE	RED
UNBALANCE/SINGLE PHASE	RED
HIGH/LOW VOLTAGE	RED